MEMORANDUM REPORT

M62-19-1

DESCRIPTION AND OPERATION OF A HAND HELD WIRE GUN

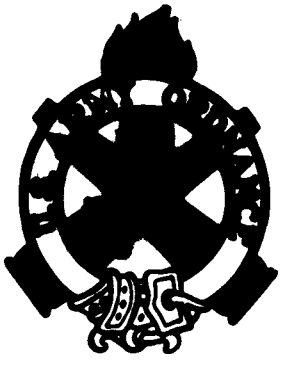
by

A. J. Grandy
and
J. W. Lettel

OMS Code 5520.12.468 IO
DA Project 596-10-001

February 1962

REPORT M62-19-1



FRANKFORD ARSENAL

PHILADELPHIA 37, PA

Frankford Arsenal
Philadelphia 37, Pa.

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DESCRIPTION AND OPERATION OF A HAND HELD WIRE GUN

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OBJECT

To develop a self-energized hand held wire gun for unconventional warfare forces that will provide an effective means of capturing personnel alive, stopping riots, and erecting fast barriers in rough terrain.

SUMMARY

A hand-held version of a wire gun was designed and developed, and a sample lot was fabricated for use in controlled tests.

During limited development time the device displayed excellent operational characteristics. Further testing will be required to accurately determine adequacy against intended targets.

Complete descriptions of the design and operation of the device are presented.

DESCRIPTION OF WIRE GUN

The wire gun developed for this application is intended primarily for use by individuals for short range operation against personnel encountered during riots or quelling an unruly mob. This device can also be used to sow or entangle a mass of barbed wire across narrow roads, paths, and the like. The completely assembled unit, ready for use is shown in figure 1.

The wire in this coil is a high strength rectangular steel wire which has been barbed and then wound in such a manner that it is not overstressed during the winding process. Upon release of the coil end, stored energy propels the wire out of the tube in a straight line so that the wire extends to a range of approximately 80 feet.

The complete system consists of a double action spring initiating assembly, a barbed wire coil, an outer container assembly, and an end cap with wing nut. See figure 2.

Initiating Mechanism

The double action spring initiating assembly is composed of four main parts; the pull ring, which is a brazed steel ring, a sear rod which has an angular cut on one end, a piston which has a mating end to fit in the sear rod, and the initiating spring. Attached to the pull ring is a red aluminum tag labeled "Pull ring to Fire." In operation, the sear rod and piston are locked together by means of mating cuts in the rod ends and act as a single unit as the pull ring is retracted to fire the device. At a point when the angled cut in the sear rod is retracted clear of the container (approx. 2.0 inches), it will release and allow the spring to reverse piston direction and propel it out of the container with the connected coil end.

Safety Assembly

The safety assembly is composed of a standard firing safety pin, a steel pull ring, and a black aluminum tag labled "SAFETY." This safety pin, when inserted properly, gives a positive visual indication that the device is safe to handle.

Wire Coil

The wire coil is composed of approximately 450 feet of flat, high strength, barbed steel wire. It is wound in such a manner that the wire contains energy and upon release of the coil end, releases this energy to propel the wire to a range of approximately 80 feet. The wire coil weighs 8. 2 lb.

Outer Container Assembly

The outer container is constructed of a steel cylinder and steel end cap brazed together. The cylinder is ten inches long and three and three-quarter inches in diameter. A steel holder is brazed into the end cap which houses the initiating mechanism.

End Cap and Wing Nut

The steel end cap contains a fiber washer which seals this end from moisture. The wing nut is assembled with an "O" ring, and is threaded into the end of the piston for shipping purposes. This wing nut also acts as a double safety. It is impossible to retract the sear rod when the wing nut is in place, even if the safety pin should be removed. The total weight of metal parts is approximately 2. 5 lb.

Complete details of construction are contained in appendix B.

OPERATING INSTRUCTIONS

Wire guns supplied in the field will be available in standard T46 ammunition cans. See figure 3. Each of the four wire guns contained in a can will be packaged in a fiberboard cylinder and equipped with a canvas carry bag. See figure 4.

Upon receipt, the units should be removed from the ammunition can as illustrated in figure 5. The pull tape is removed from the shipping cylinder and the end cap lifted as shown in figure 6. The wire gun will be exposed upon removal of the packing excelsior and cardboard spacers. Complete packing arrangement within the tube is illustrated in figure 7. The wire gun can now be removed from the fiberboard cylinder as shown in figure 8.

In field use individual wire guns are carried in a canvas bag which is slung over the shoulder. The nylon belt which is supplied should be used when firing from the waist. The "PULL RING" of the firing assembly snaps onto the belt as shown in figure 9.

In order to prepare the device for firing, the end cap is removed by unscrewing the wing nut, (figures 10 and 11).

When ready to use, the safety pin is removed by pulling the ring with black tag labeled "SAFETY." (Figure 12) Three methods are suggested for initiation and operation of this device.

Figure 13 depicts the first and recommended method of firing. A nylon belt is supplied in each shipping container. The belt is worn around the user's waist and the "pull ring" of the device snaps onto it. With the device attached to the belt the gun is held securely with both hands and pulled away from the body. A force of 20 lbs. is required to retract the firing assembly two inches after which it will unlatch. Spring force will then propel the piston out of the container and expel the leading edge of the wire. The barbed wire will begin paying out, up to an approximate range of 80 feet. The gun may be guided by maneuvering the container similar to a water hose to lay wire on target. It will take approximately 6 or 7 seconds to expend the complete contents of the coil.

The second method of initiating the device is shown in figure 14. The gun is held in the crook of the left arm and actuated with the right hand.

The third method is depicted in figure 15. The device is aimed with the left hand and actuated with the right hand.

Figure 16 shows a section of wire as it would appear coming from the gun.

Notes:

1. There are no propellants or explosives used in this device. Velocity imparted to the wire is "built in" during the winding of the coil.

2. These devices are in the development stage and are not intended as fully qualified and tested equipment.

3. Each device has a serial number engraved on the end of the sear rod and is intended to be used for identification of the device in case of abnormal operation. In case of any such abnormal operation this serial number should be noted and transmitted back to the manufacturing agency.

4. Wherever possible, all used metal parts should be returned to sender for reloading.

REFERENCES

1. A. J. Grandy, "A Proposal for the Development of a Wire Gun," Frankford Arsenal Proposal P60-5-1, June 1960.

2. Frankford Arsenal Brochure, "Barnyard Ordnance," April 1961; classified SECRET.

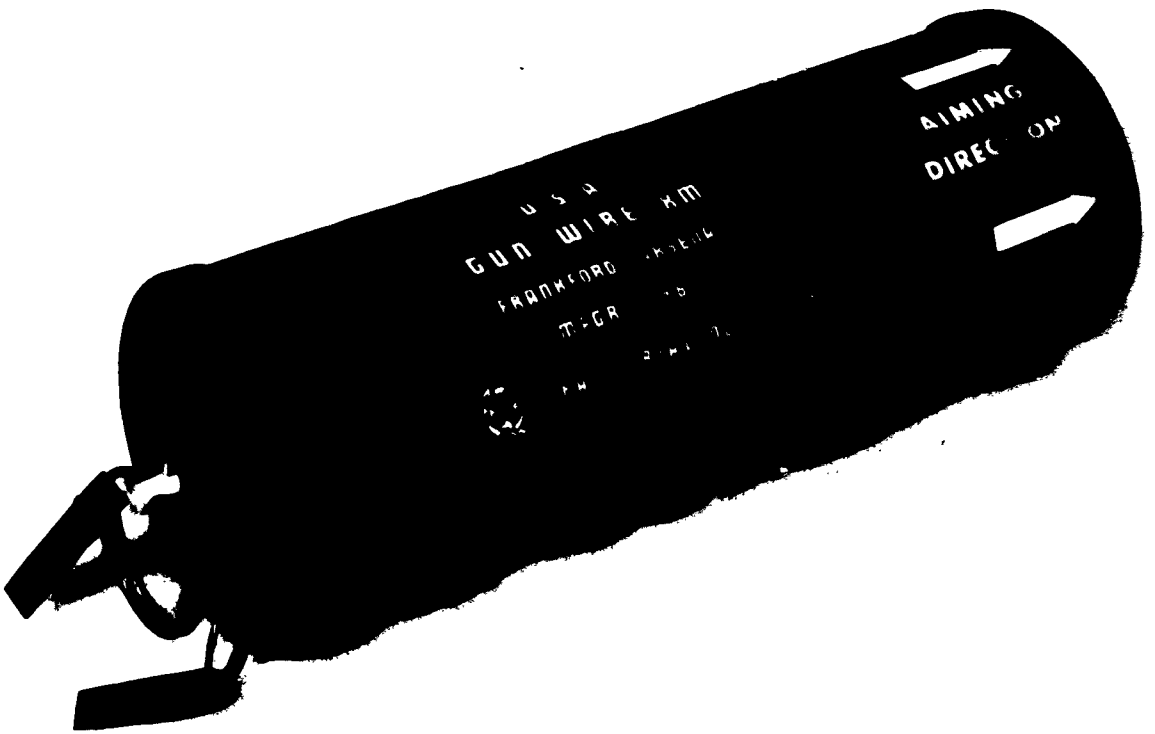
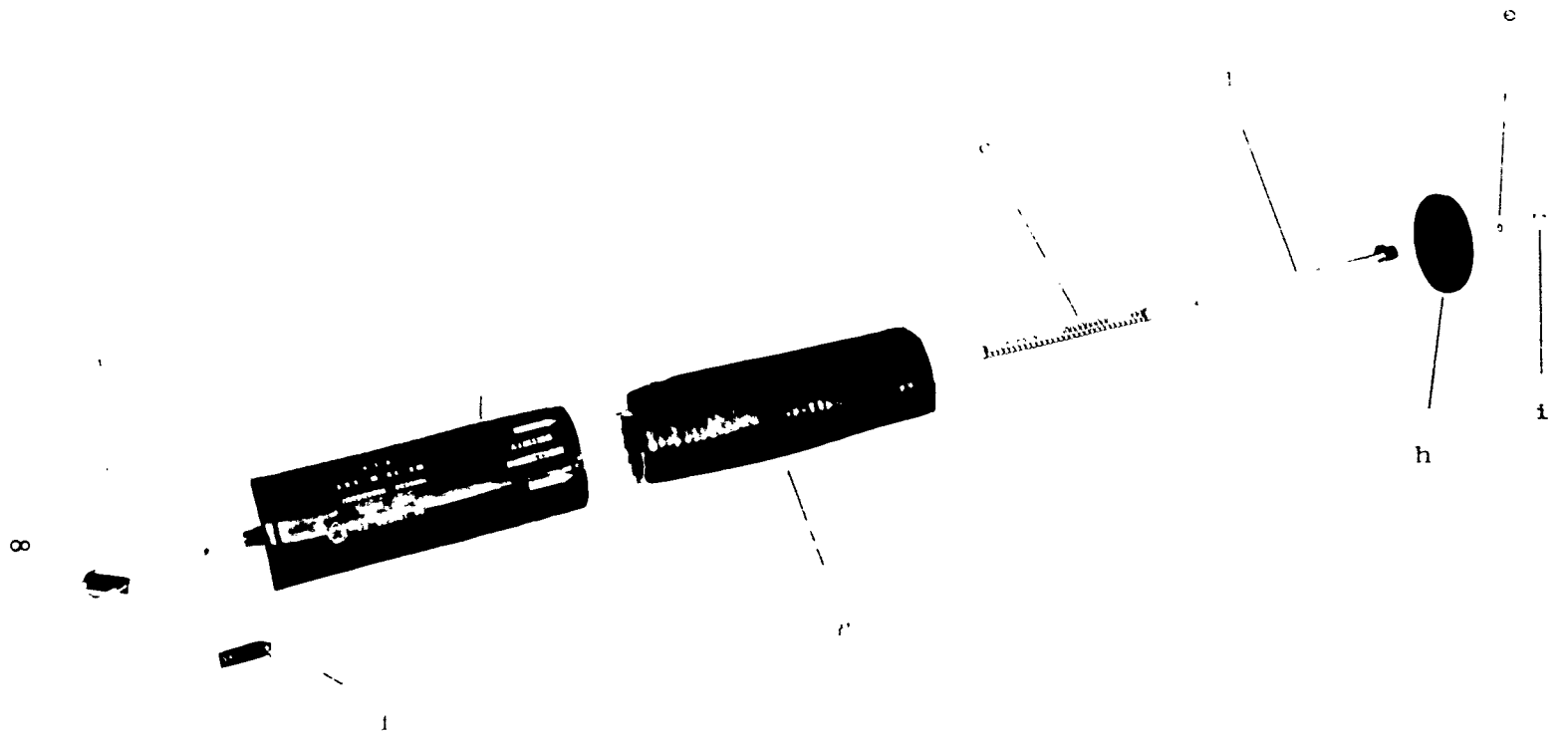


Figure 1. Gun, Wire, XM - Exterior View



a - Firing assy
b - Outer container assy
c - Spring
d - Piston
e - "O" ring
f - Safety assy
g - Wire coil
h - End cap
i - Wing nut

Figure 2. Partial Disassembly of Wire Gun

Figure 3. Side View of Wire Gun Shipping Can

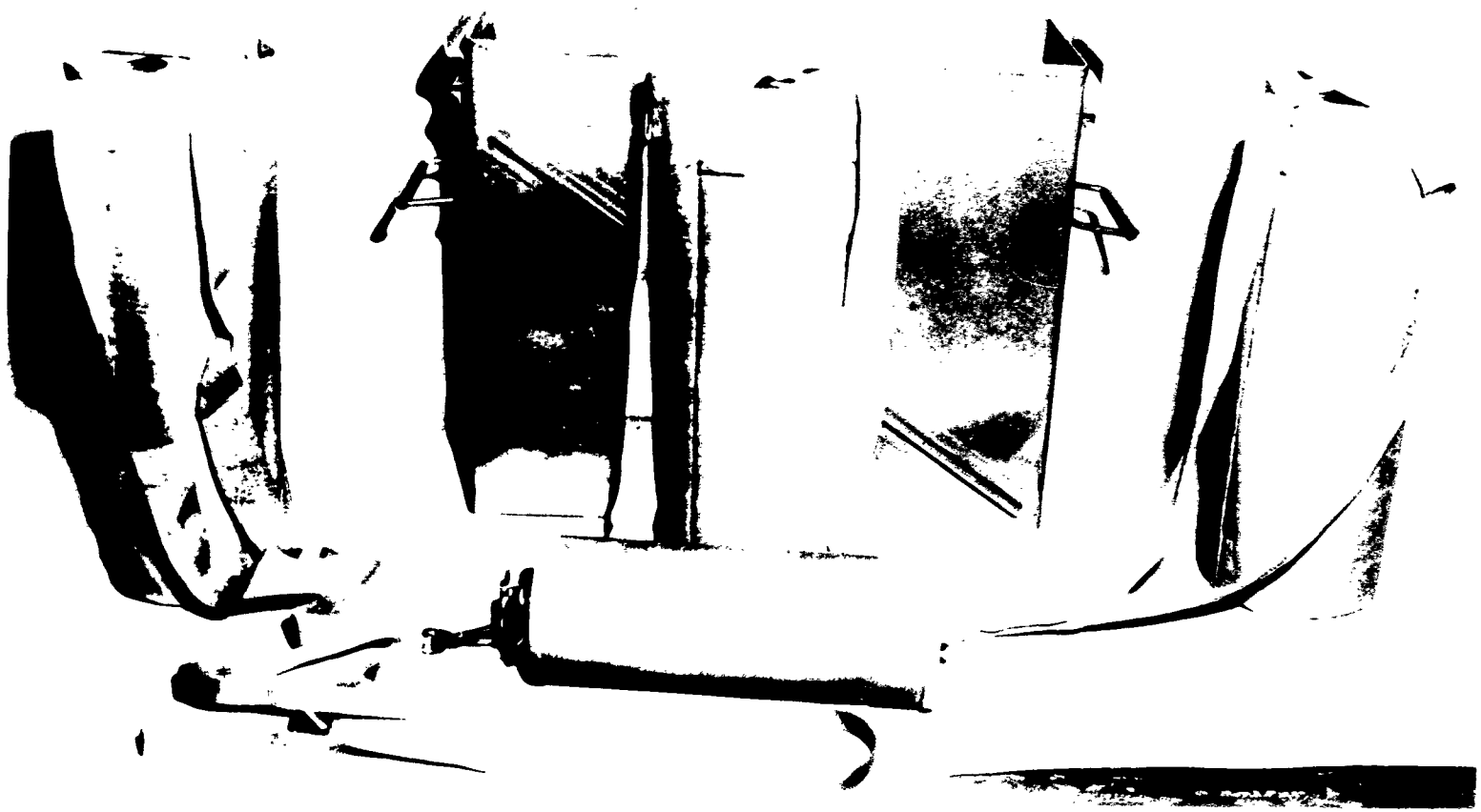


Figure 4. Four Wire Guns are Loaded in Each Shipping Can

Figure 5. Wire Gun and Carry Bag Being Removed from Shipping Can

Figure 6. Removing Cap from Cardboard Container

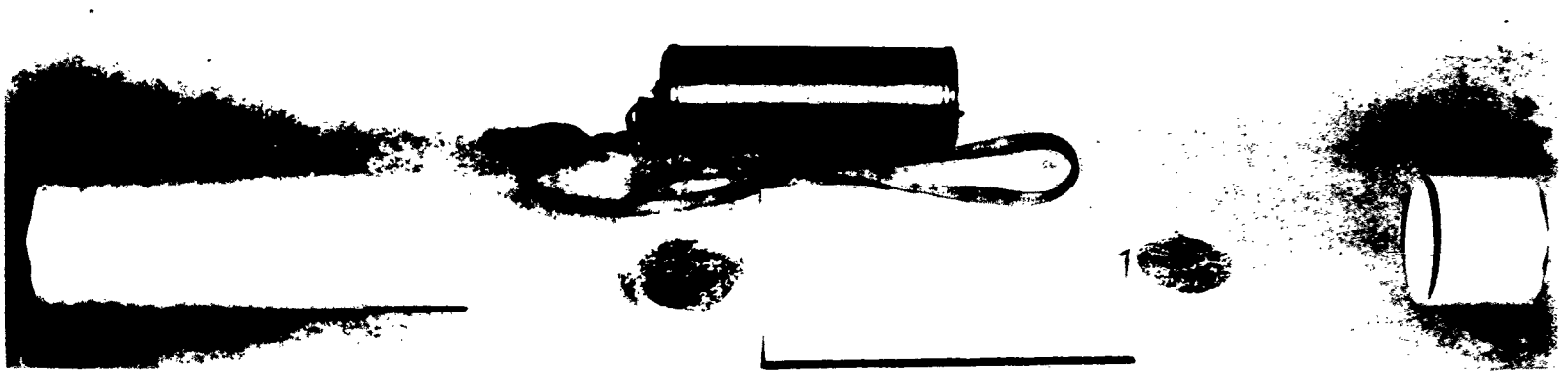


Figure 7. View of Wire Gun Packing Materials

Figure 8. Removing Wire Gun from Cardboard Container

Figure 9. Belt Attachment to Wire Gun

Figure 10. Step 1 - Unscrew Wing Nut

Figure 11. Step 2 - Remove End Cap

Figure 12. Step 3 - Remove Safety Pin

Figure 13. Belt Method of Firing Wire Gun

Figure 14. Elbow Rest Firing Position

Figure 15. Hand Held Firing Position

Figure 16. Wire Sample After Fired From Gun

APPENDIX A

DEVELOPMENT OBJECTIVE

DEVELOPMENT OBJECTIVE

Statement of Requirement

a. The requirement is for a coil of high strength steel wire wound in such manner that when its inner end is released it axially extends in essentially a straight line to a range of up to 100 feet using stored energy resulting from the winding process. With barbs on the wire, an antipersonnel or riot control weapon is created for field use. This wire gun will significantly increase the capabilities of unconventional warfare forces to harass the enemy and to support theatre operations.

Materiel

A. Performance Required

The wire gun must be positive in action, once released it must continue to exude wire until the entire coil is expended. Configuration of the wire mass at the target must be in accordance with its designed use. For antipersonnel use the barbs must be positioned so as to hamper escape of personnel enmeshed. For riot control the wire must "ball" with open barbs so as to halt a crowd. The wire gun device must be positive, simple, and reliable for use by indigenous personnel in unconventional warfare operations. Temperature within the target area must not be a limiting factor to its effectiveness.

B. Description of the Desired Equipment

A wire gun similar to that developed by F. A.* should be considered. With design modifications, it should be effective in a wide

*A. J. Grandy, A Proposal for the Development of a Wire Gun, Frankford Arsenal Proposal P60-5-1, June 1960.

variety of applications. The basic design consists of a seemingly harmless coil of wire. The internal energy is achieved by a special winding process. The intended use will determine the size and geometry of the wire. If sophistication is required, it will be concealed in the coil core.

Qualitative Characteristics

1. The device must resemble a harmless coil of wire to facilitate shipment or carry into an area of covert operations.

2. A positive and simple means of employment in the intended application must be provided. A minimum number of types are desired for multiple uses, but a family of devices is acceptable. Non-explosive devices are desired but incorporation of propellant will be acceptable if warranted by extension of range.

3. The device must be such that the source of wire cannot be determined from the expended wire.

4. Storage conditions and effective life must not be critical.

Operational and Organizational Concepts

1. Operational Concept - The device will provide unconventional warfare forces with an efficient means of capturing personnel alive, stopping riots, and generally reaching inaccessible positions.

2. Organizational Concept - The devices will be issued to unconventional warfare forces under the appropriate table of allowances.

3. Operational Urgency - These devices are required as early as possible, preferably within one year.

Maintenance Concept

There shall be no maintenance required for the device in storage or in the field, during its service life.

APPENDIX B

DETAIL DRAWINGS

Note:

Detail drawings and packaging instructions located in appendixes B and C are presented FOR INFORMATION ONLY and should not be used for manufacturing purposes.

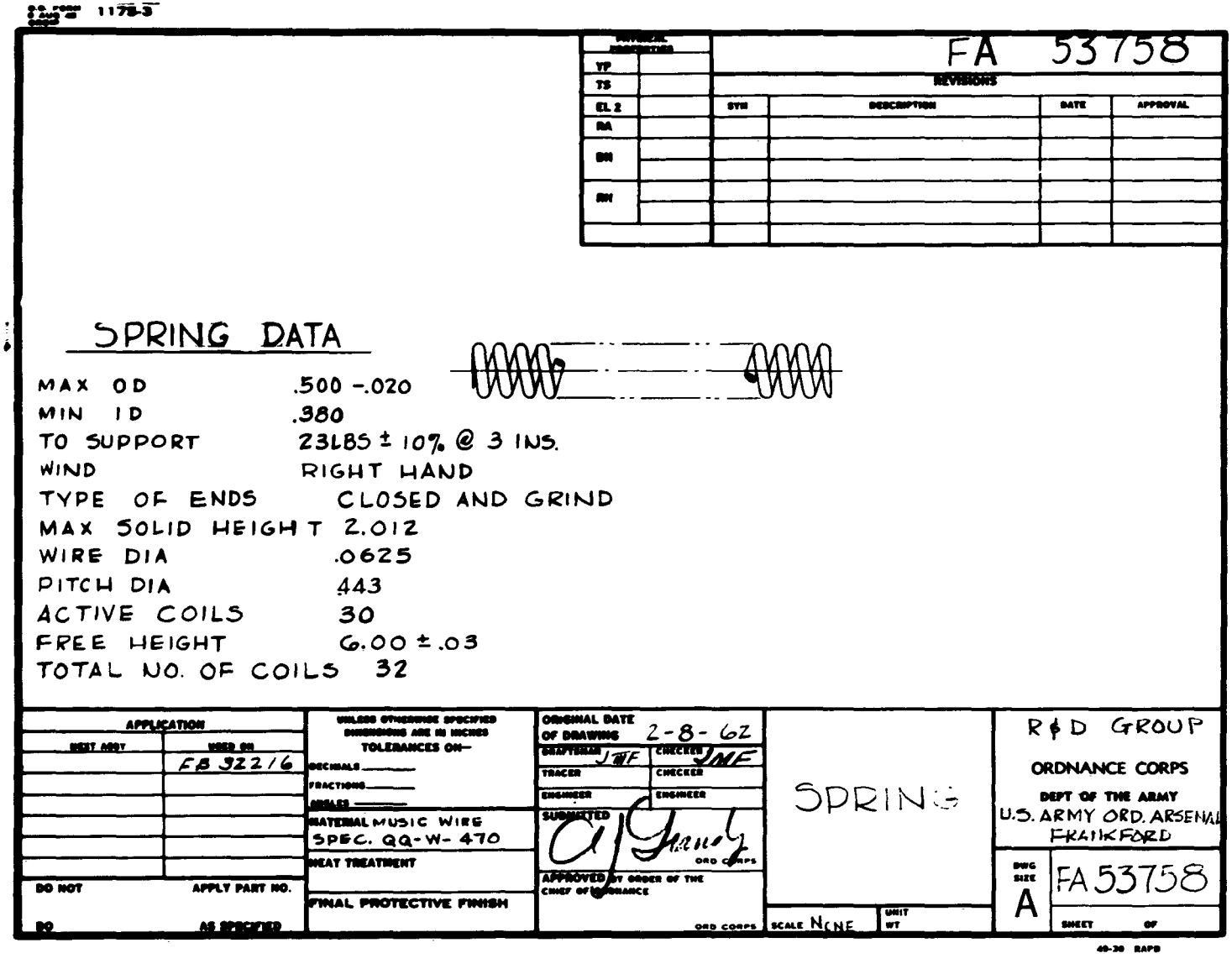


Figure B-1. Spring

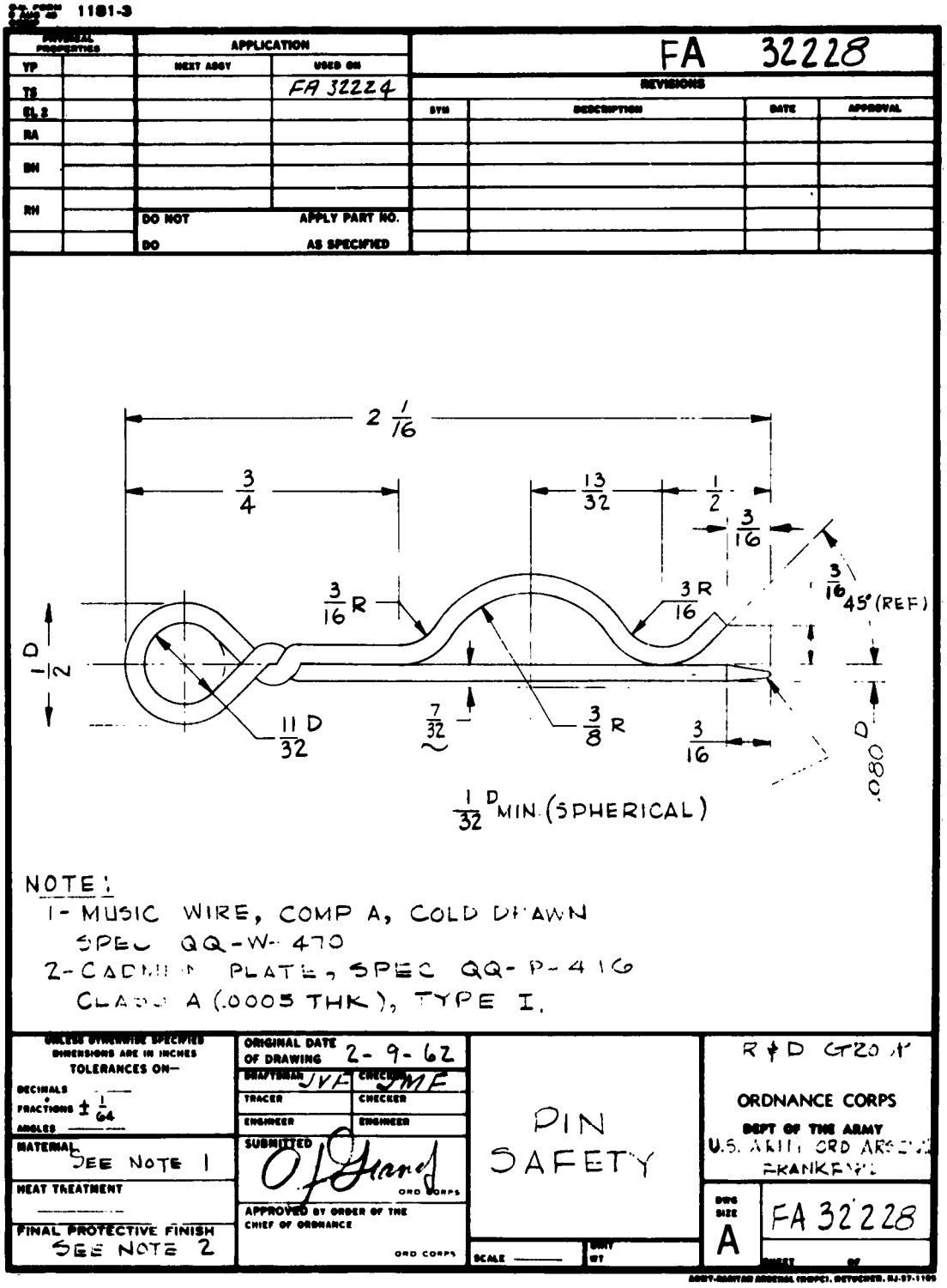


Figure B-2. Pin, Safety

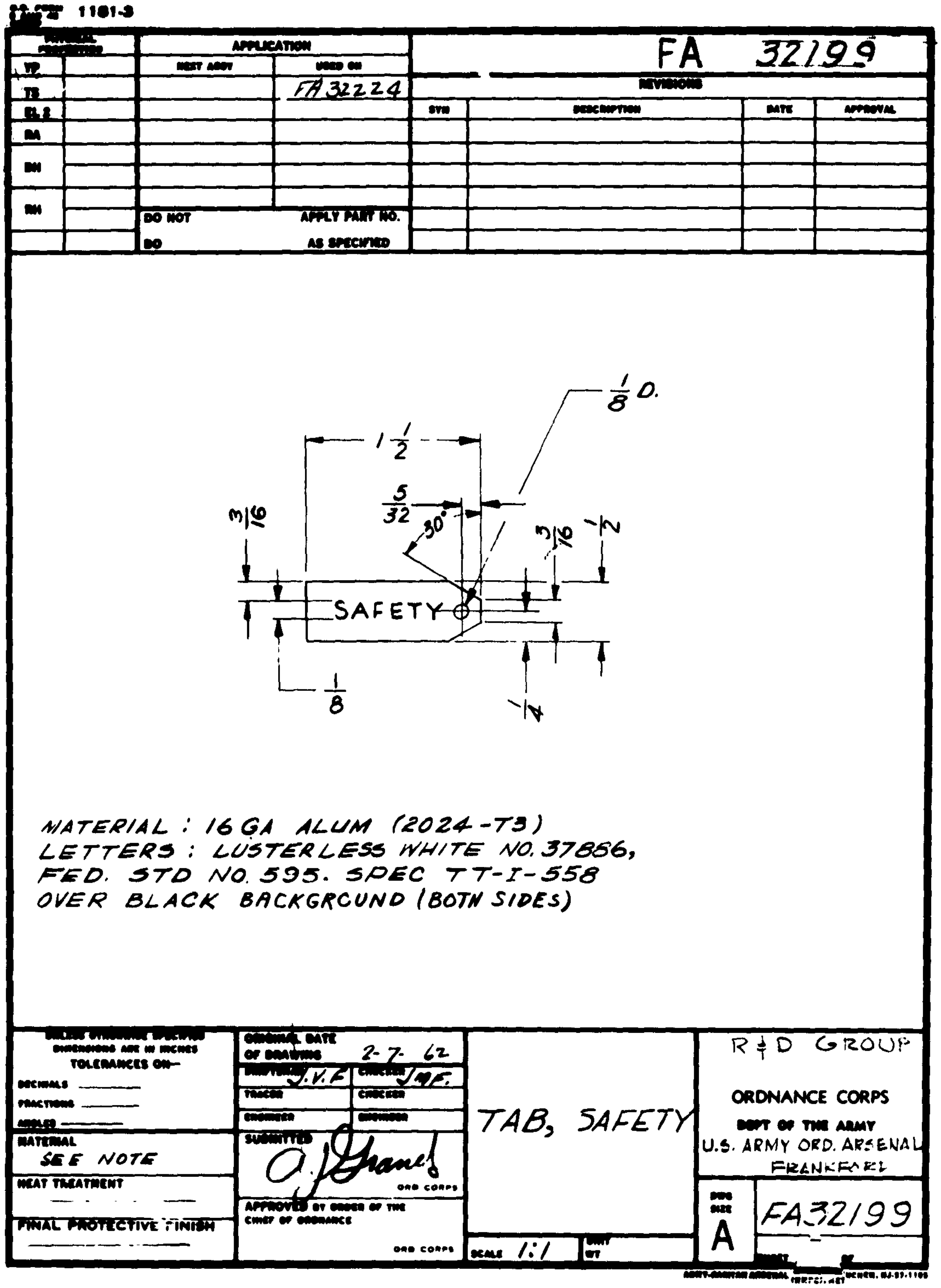


Figure B-3. Tab, Safety

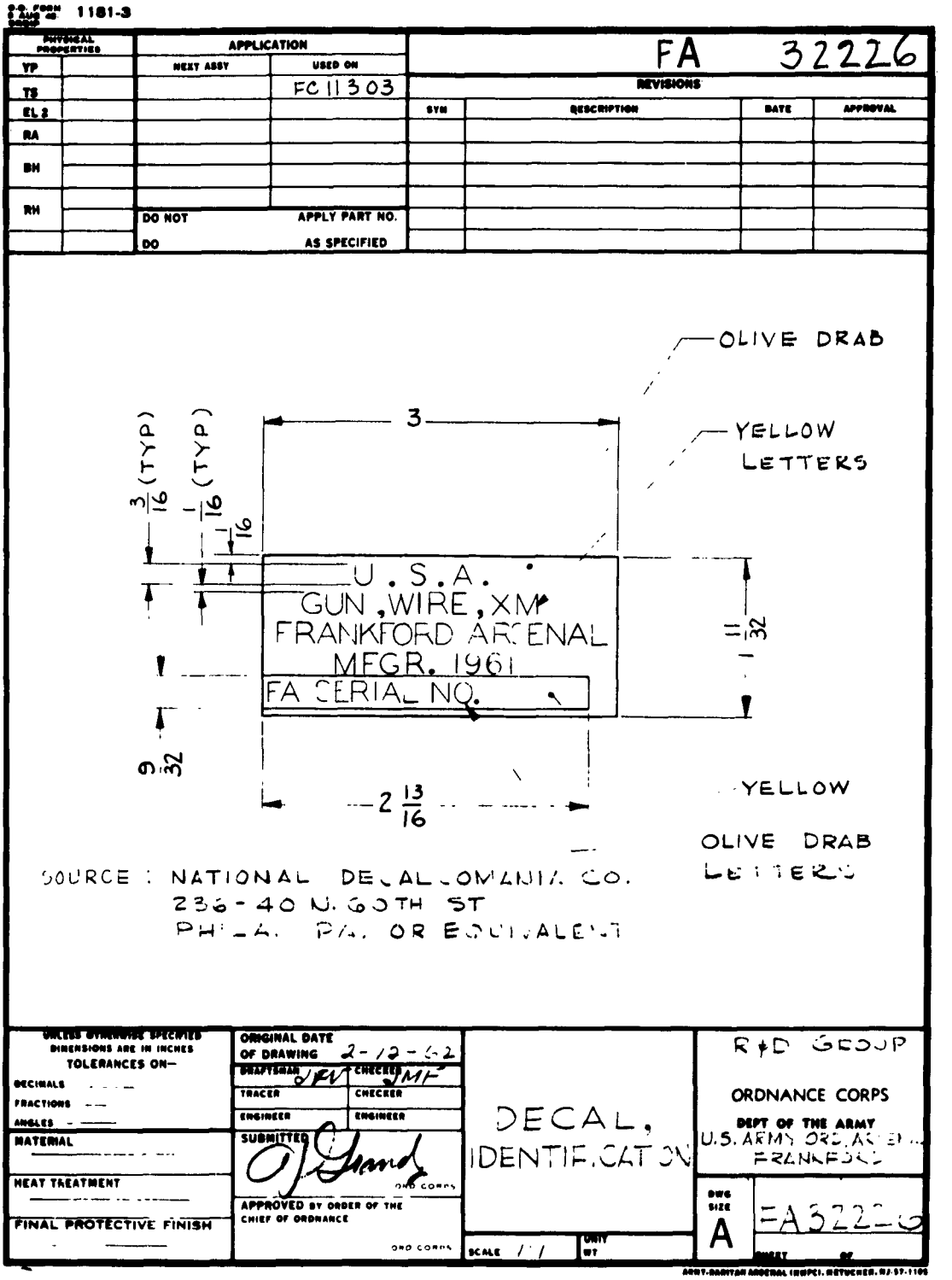


Figure B-4. Decal, Identification

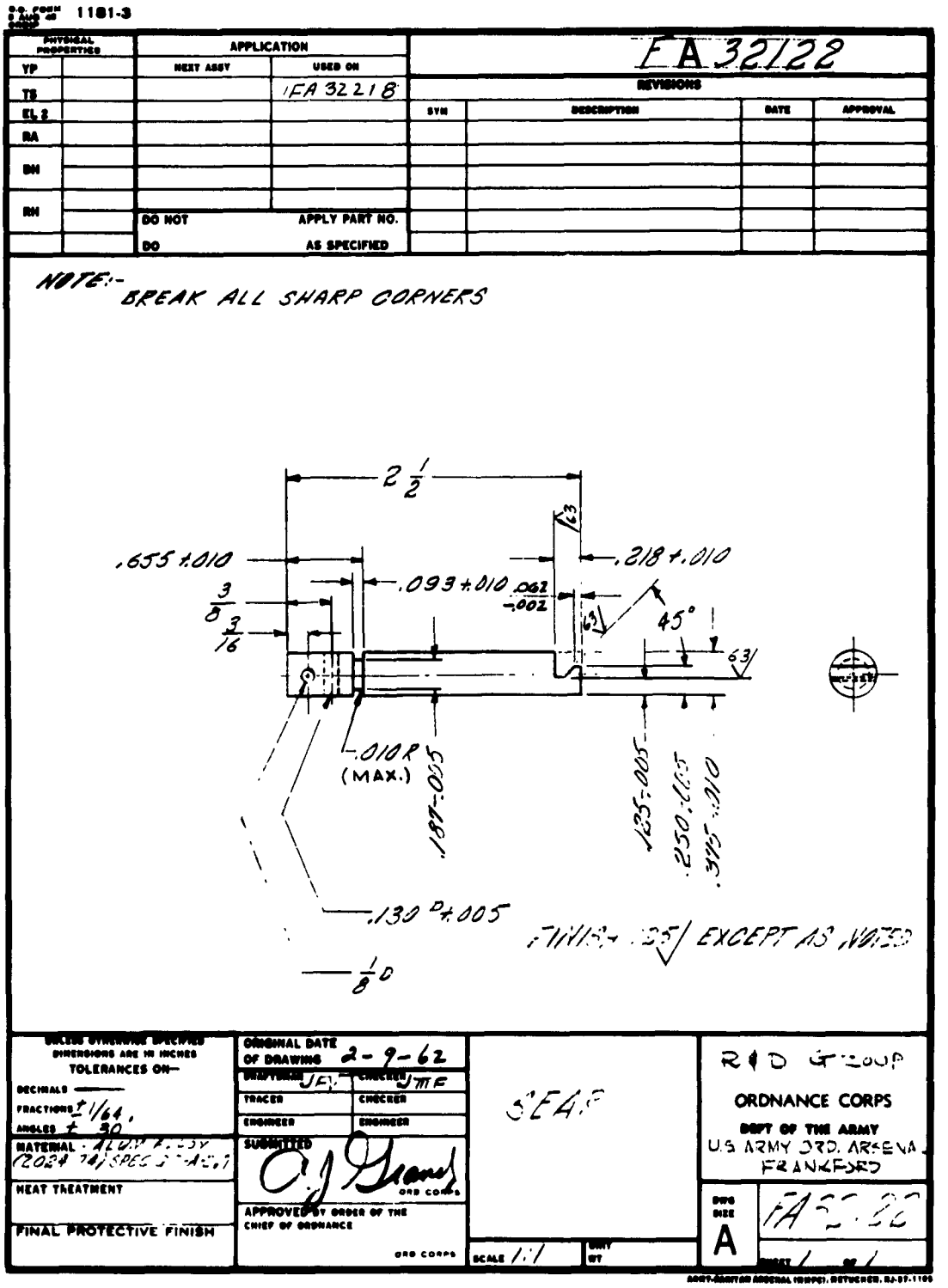
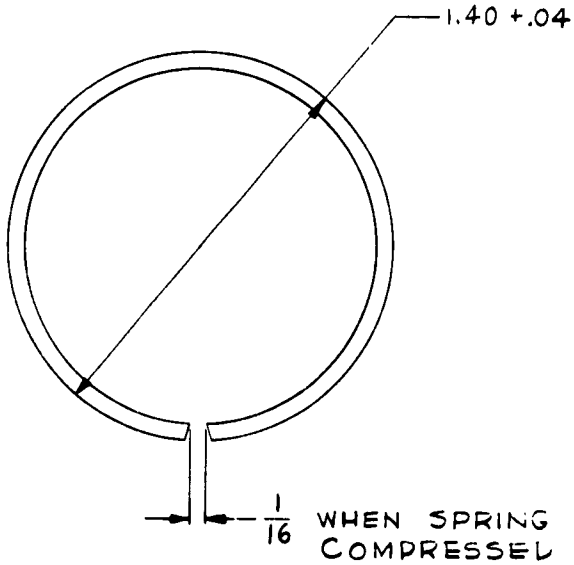


Figure B-5. Sear

O.O. FORM 1181-3

APPLICATION		AFA 32310
NEXT ASSY	USED ON	
	FA 32218	
DO NOT	APPLY PART NO.	
DO	AS SPECIFIED	

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL



WHEN SPRING IS COMPRESSED TO 1.34 O.D.

ZINC PLATE, CHROMATE DIP, TYPE I, CLASS RSC, SPEC ST-O-2. TO BE GIVEN A DEHYDROGENATION BAKE AT 350° TO 400°F FOR 1 HOUR AFTER PLATING AND BEFORE CHROMATING.

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON—
DECIMALS ____
FRACTIONS ± 1/64
ANGLES ____

MATERIAL MUSIC WIRE, SAE A, QQ-W-470 .060 DIA.

HEAT TREATMENT ____

FINAL PROTECTIVE FINISH SEE NOTE

ORIGINAL DATE OF DRAWING 14 Feb 62

DRAFTSMAN JTE | CHECKER ____
TRACER | CHECKER
ENGINEER | ENGINEER

SUBMITTED O J Graves ORD CORPS

APPROVED BY ORDER OF THE CHIEF OF ORDNANCE
ORD CORPS

RING

SCALE 2:1 | UNIT WT

R & D GROUP
ORDNANCE CORPS
DEPT OF THE ARMY
U.S. ARMY ORD. ARSENAL
FRANKFORD

DWG SIZE A | FA 32310 | SHEET 1 OF 1

Figure B-6. Ring

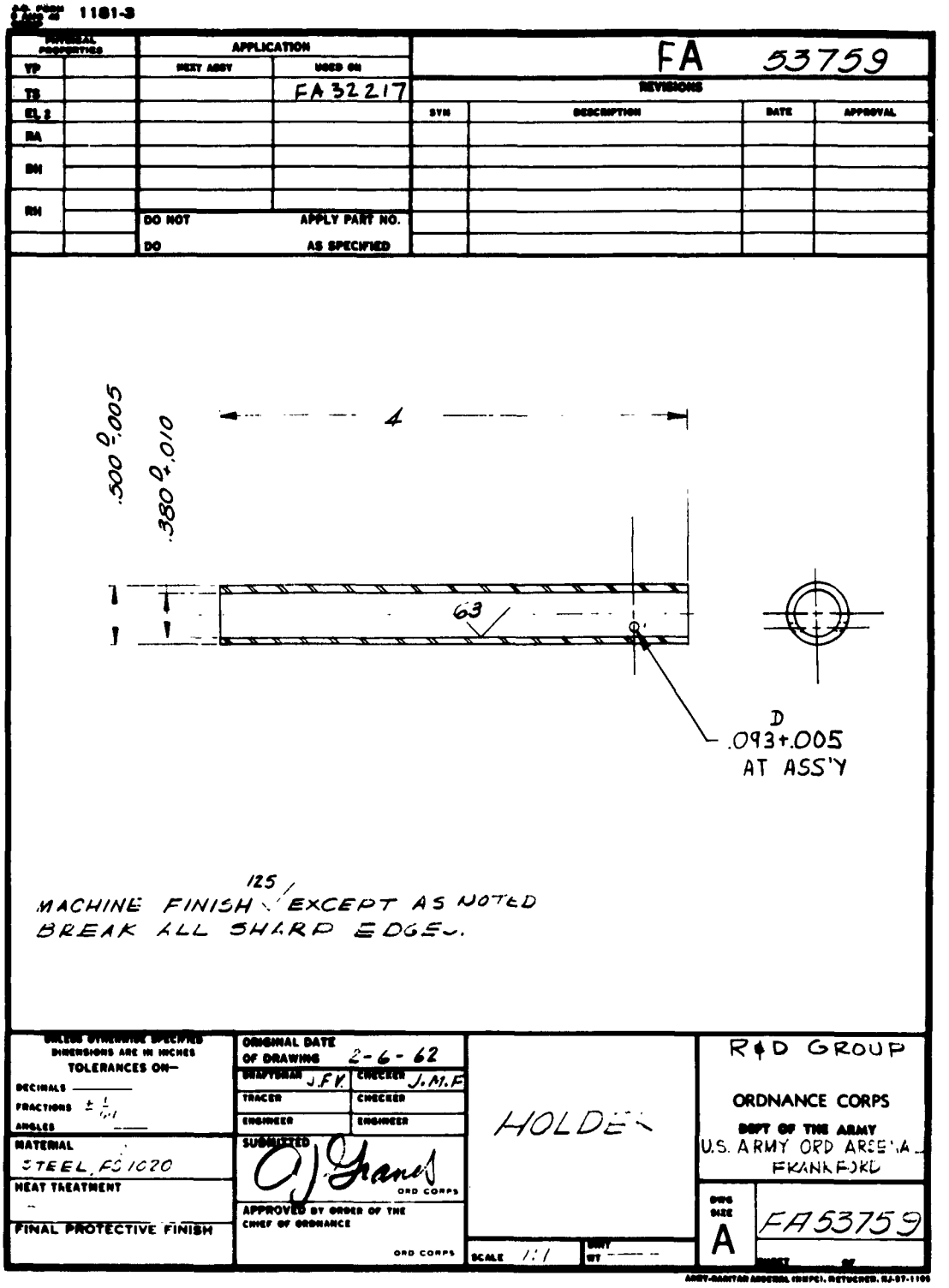
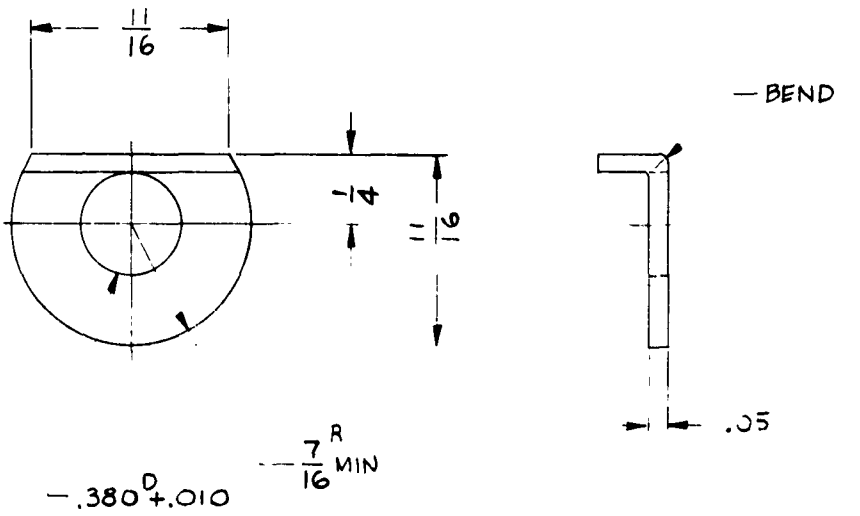


Figure B-7. Holder

O.O. FORM 1181-3

MATERIAL PROPERTIES		APPLICATION		FA 32219			
YP		NEXT ASSY	USED ON				
TS			FB 53790	REVISIONS			
EL 2				SYM	DESCRIPTION	DATE	APPROVAL
RA							
BH							
RH		DO NOT	APPLY PART NO.				
		DO	AS SPECIFIED				



REMOVE BURRS AND SHARP EDGES

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON—
DECIMALS
FRACTIONS
ANGLES

MATERIAL STEEL, (FS 1020)

HEAT TREATMENT

FINAL PROTECTIVE FINISH

ORIGINAL DATE OF DRAWING 2-9-62

DRAFTSMAN | CHECKER
TRACER | CHECKER
ENGINEER | ENGINEER

SUBMITTED A. J. Grand ORD CORPS

APPROVED BY ORDER OF THE CHIEF OF ORDNANCE
ORD CORPS

WASHER MODIFIED

SCALE 2:1 | UNIT WT

ORDNANCE CORPS
DEPT OF THE ARMY
U.S. ARMY ORD. ARSENAL
FRANKFORD

DWG SIZE A | FA32219

SHEET OF

Figure B-8. Washer, Modified

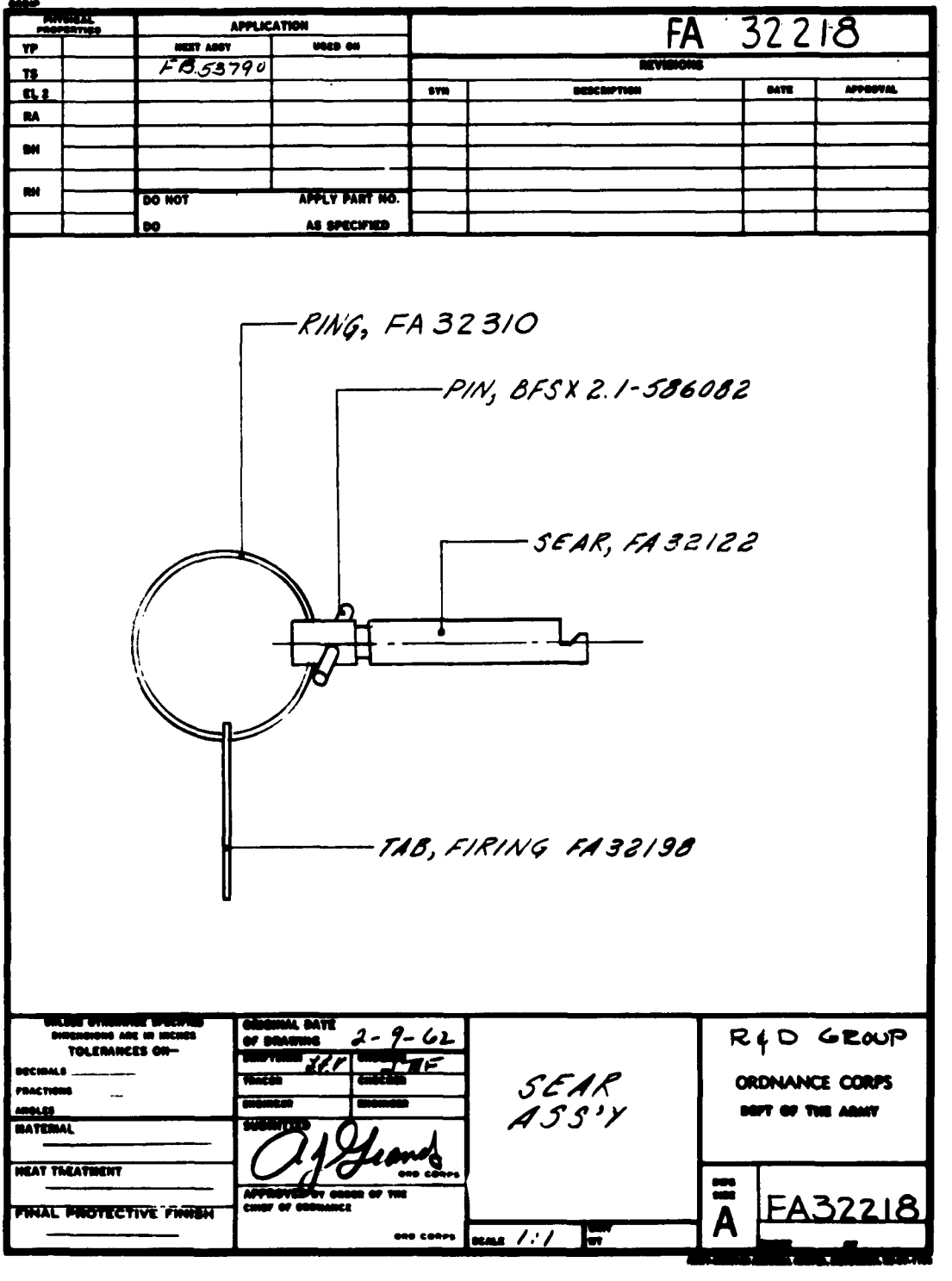
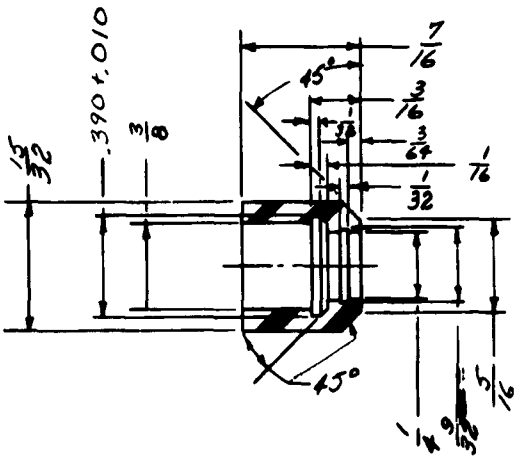


Figure B-9. Sear, Ass'y

O.O. FORM 1181-3

MATERIAL PROPERTIES		APPLICATION		FA 32220
YP		NEXT ASSY	USED ON	
TS			FB53790	REVISIONS
EL. 2				SYM / DESCRIPTION / DATE / APPROVAL
RA				
BH				
RH				
		DO NOT	APPLY PART NO.	
		DO	AS SPECIFIED	



UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON—
DECIMALS —
FRACTIONS ±
ANGLES ± 30'

ORIGINAL DATE OF DRAWING FEB. 9, 1962
DRAFTSMAN EEV CHECKER JMF
TRACER CHECKER
ENGINEER ENGINEER

SUBMITTED C. J. Frank ORD CORPS
APPROVED BY ORDER OF THE CHIEF OF ORDNANCE
ORD CORPS

MATERIAL RUBBER MIL-R-3065
HEAT TREATMENT —
FINAL PROTECTIVE FINISH NATURAL BLACK

BUSHING

SCALE 2:1 QUANTITY

R & D GROUP
ORDNANCE CORPS
DEPT OF THE ARMY
U.S. ARMY ORD. ARSENAL
FRANKFORD

DWG SIZE A
FA 32220
SHEET 1 OF 1

Figure F-10. Bushing

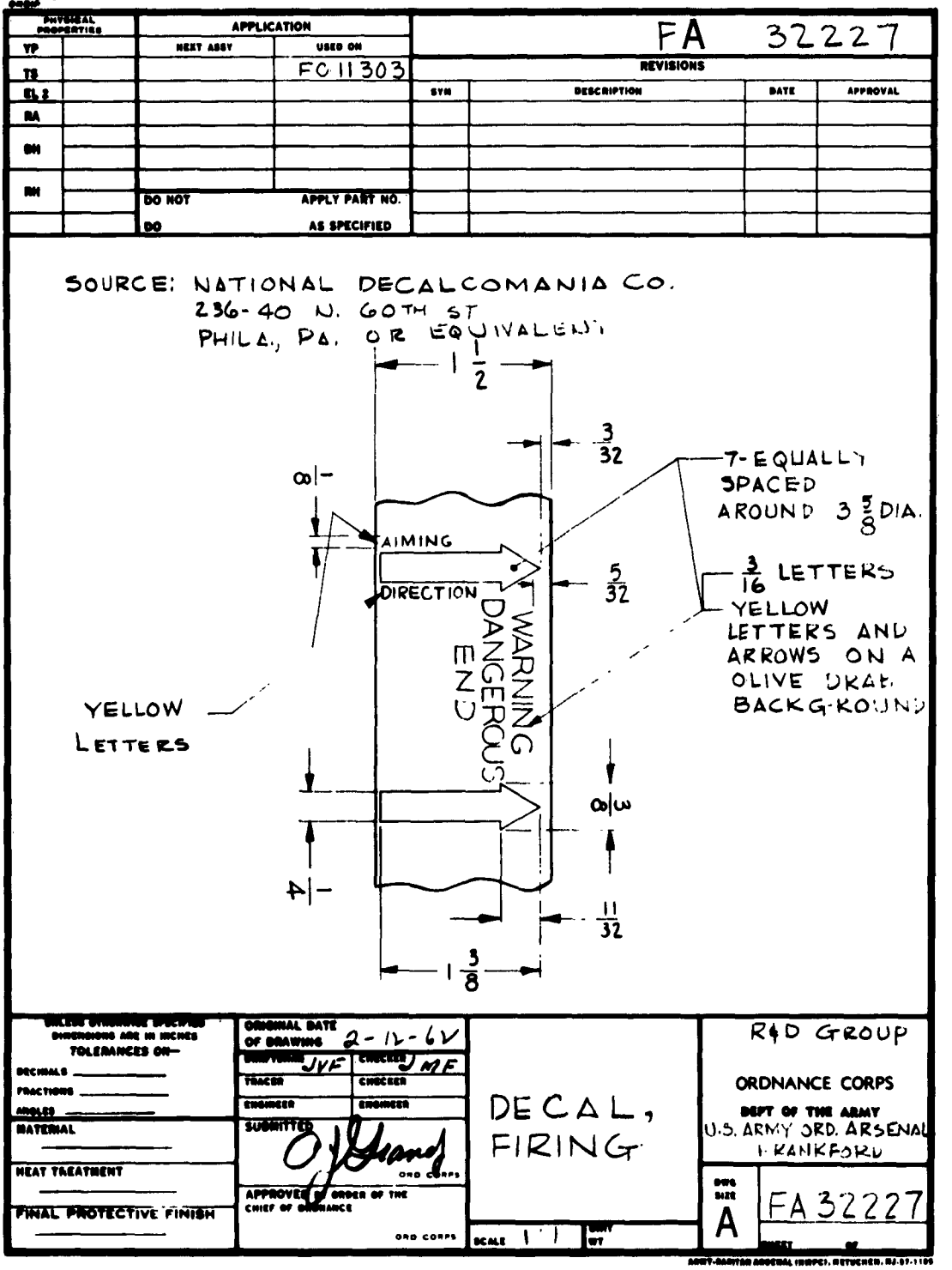
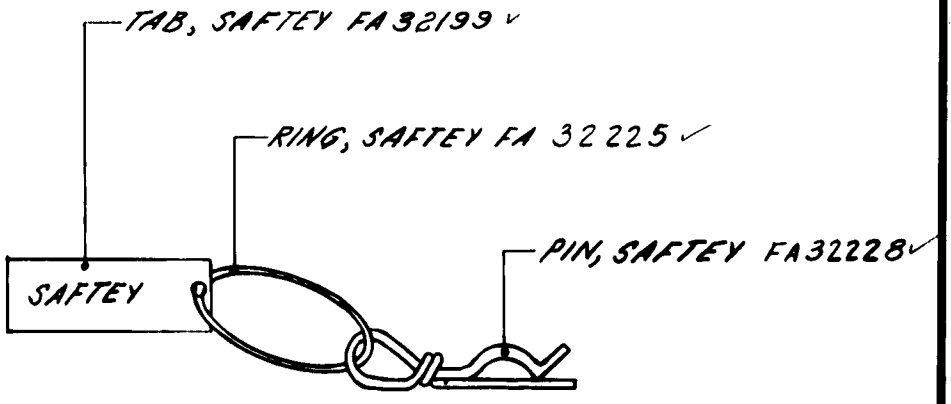


Figure B-11. Decal, Firing

O.O. FORM 1181-3
9 AUG 48
ORDNP

PHYSICAL PROPERTIES		APPLICATION		FA 32224			
YP		NEXT ASSY	USED ON	REVISIONS			
TS		FD23191		SYM	DESCRIPTION	DATE	APPROVAL
EL 2							
RA							
BH							
RH							
		DO NOT	APPLY PART NO.				
		DO	AS SPECIFIED				



UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON—
DECIMALS
FRACTIONS
ANGLES
MATERIAL
HEAT TREATMENT
FINAL PROTECTIVE FINISH

ORIGINAL DATE OF DRAWING 2-12-62
DRAFTSMAN J.F.V. | CHECKER JHF
TRACER | CHECKER
ENGINEER | ENGINEER
SUBMITTED O.J. Grandy ORD CORPS
APPROVED BY ORDER OF THE CHIEF OF ORDNANCE
ORD CORPS

SAFTEY PIN ASS'Y

SCALE 1:1

R&D GROUP
ORDNANCE CORPS
DEPT OF THE ARMY
U.S. ARMY ORD. ARSENAL
FRANKFORD

SIZE A
FA32224

Figure B-12. Safety Pin, Ass'y

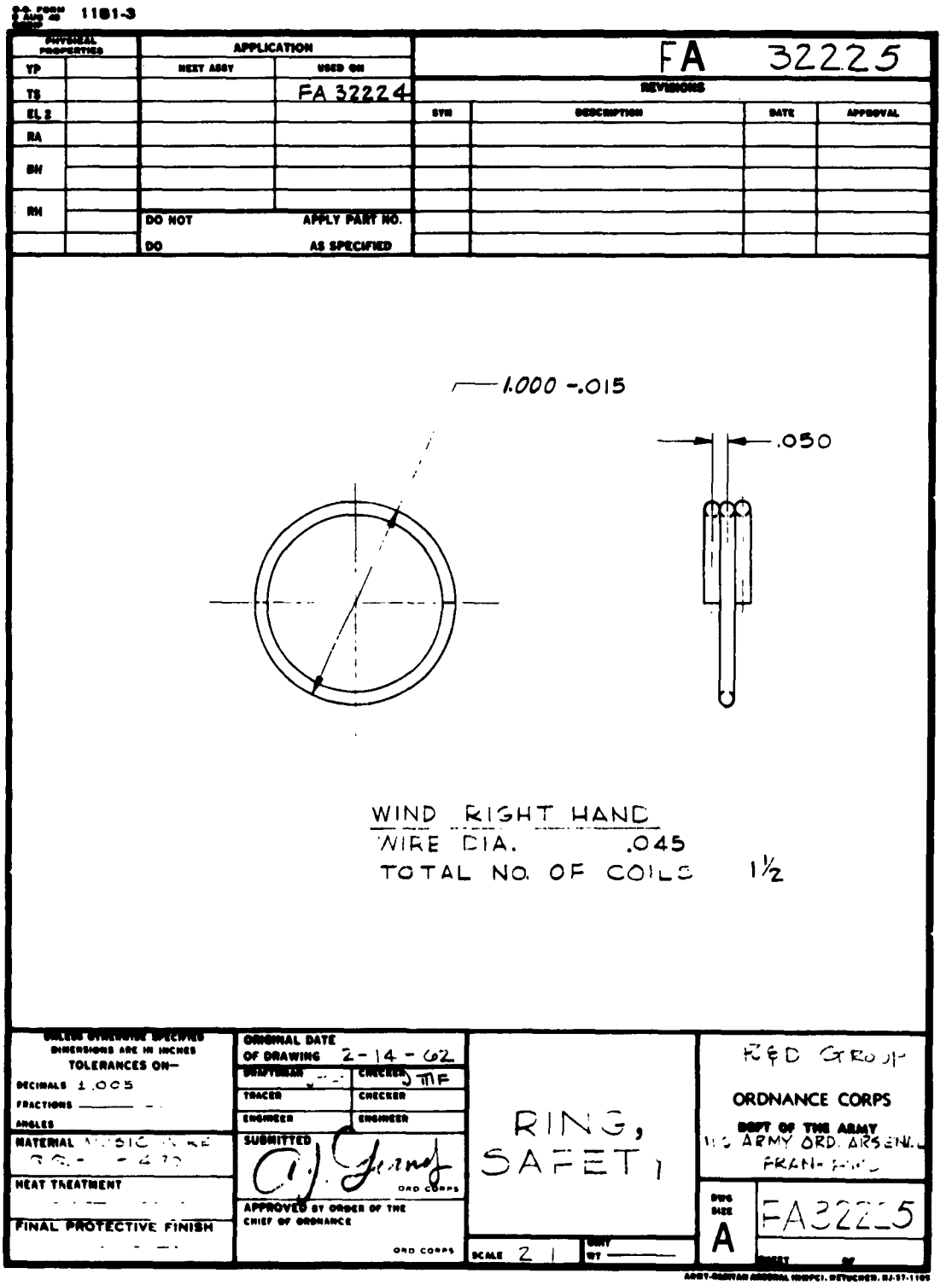


Figure B-13. Ring, Safety

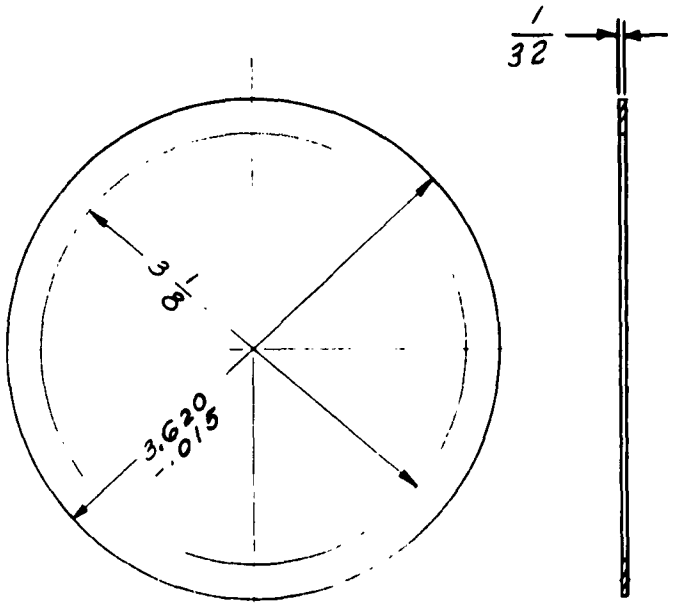
O.O. FORM 1181-3
6 AUG 48

MATERIAL PROPERTIES		APPLICATION	
YP		NEXT ASSY	USED ON
TS			FA32221
EL 2			
RA			
BH			
RH		DO NOT	APPLY PART NO.
		DO	AS SPECIFIED

FA 32223

REVISIONS

SYM	DESCRIPTION	DATE	APPROVAL



GASKET MAT'L, NON-METALLIC, MIL-G-12803

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON—
DECIMALS _
FRACTIONS ____
ANGLES ____

MATERIAL SEE NOTE

HEAT TREATMENT

FINAL PROTECTIVE FINISH

ORIGINAL DATE OF DRAWING 2-6-42

DRAFTSMAN JFF | CHECKER JAF
TRACER | CHECKER
ENGINEER | ENGINEER

SUBMITTED [signature] ORD CORPS

APPROVED BY ORDER OF THE CHIEF OF ORDNANCE
ORD CORPS

GASKET

SCALE 1:1 | UNIT WT

RID GROUP
ORDNANCE CORPS
DEPT OF THE ARMY
U.S. ARMY ORD. ARSENAL
FRANKFORD

DWG SIZE A | FA 32223 | SHEET OF

ARMY-NAVY-AAF ORDNANCE INSPECT. RETOUCHED. RJ-37-1105

Figure B-14. Gasket

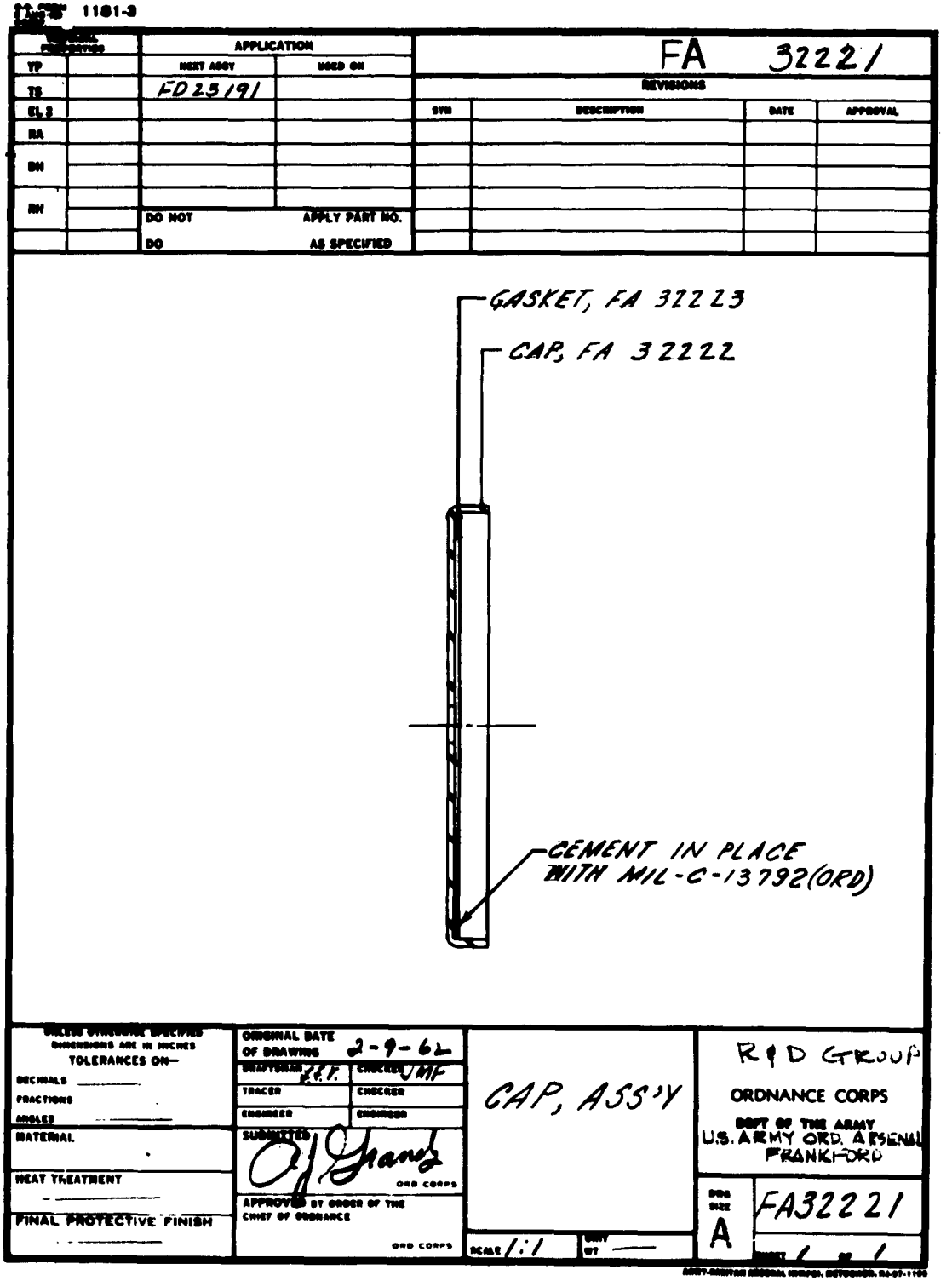


Figure B-15. Cap, Ass'y

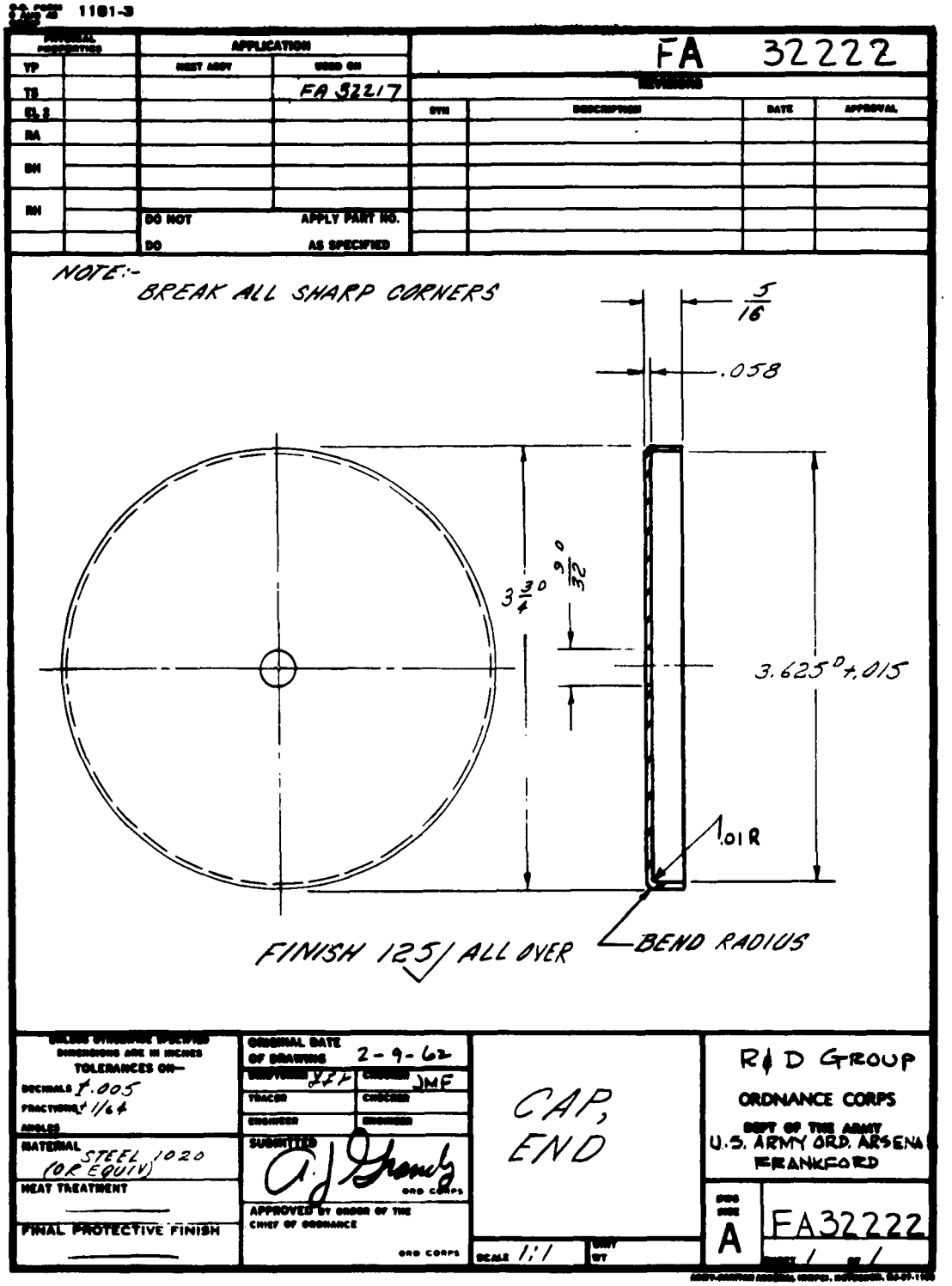


Figure B-16. Cap, End

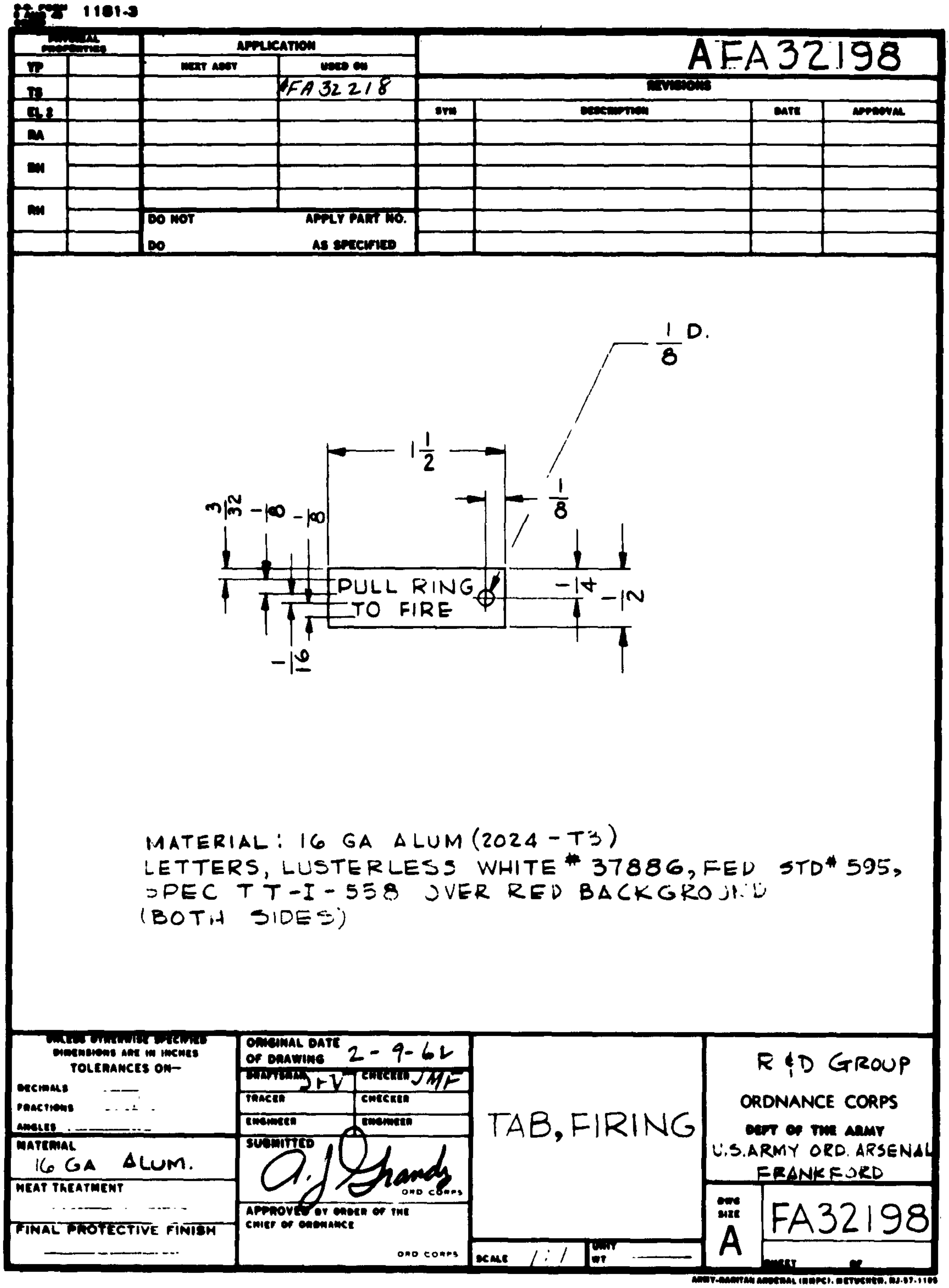
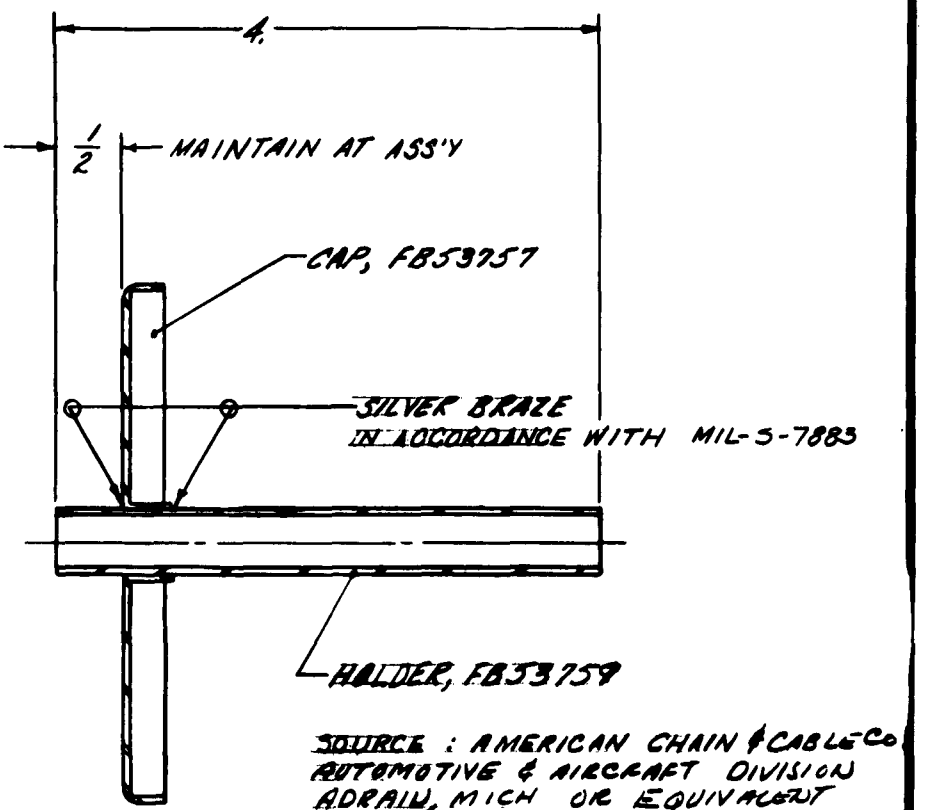


Figure B-17. Tab, Firing

O.O. FORM 1181-3

MATERIAL PROPERTIES		APPLICATION		FA 32217
YP		NEXT ASSY	USED ON	
TS		FB 53786		
EL 2				REVISIONS
RA				SYM / DESCRIPTION / DATE / APPROVAL
BH				
RH		DO NOT	APPLY PART NO.	
		DO	AS SPECIFIED	



UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON— DECIMALS ____ FRACTIONS ____ ANGLES ____	ORIGINAL DATE OF DRAWING 2-9-62	CAP & HOLDER ASS'Y	R & D GROUP ORDNANCE CORPS DEPT OF THE ARMY J.S. ARMY ORD. ARSENAL FRANKFORD
MATERIAL	DRAWN J.V.F CHECKED J.W.F		
HEAT TREATMENT	TRACER CHECKER		
FINAL PROTECTIVE FINISH	ENGINEER ENGINEER		SIZE A FA32217
	SUBMITTED O.J. Grant ORD CORPS		SCALE 1:1 WT SHEET 1 OF 1
	APPROVED BY ORDER OF THE CHIEF OF ORDNANCE ORD CORPS		

Figure B-18. Cap & Holder Ass'y

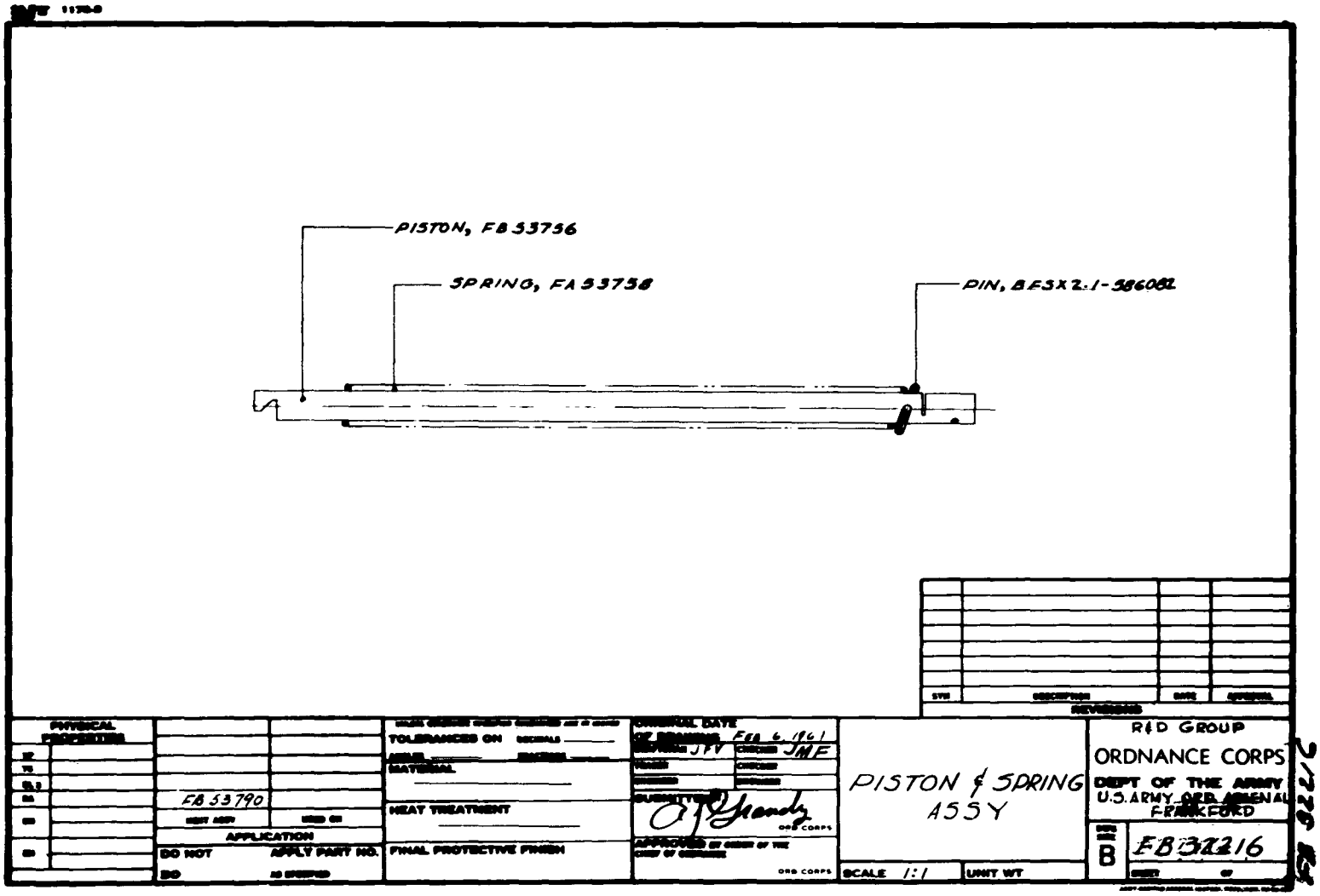


Figure B-19. Piston & Spring Ass'y

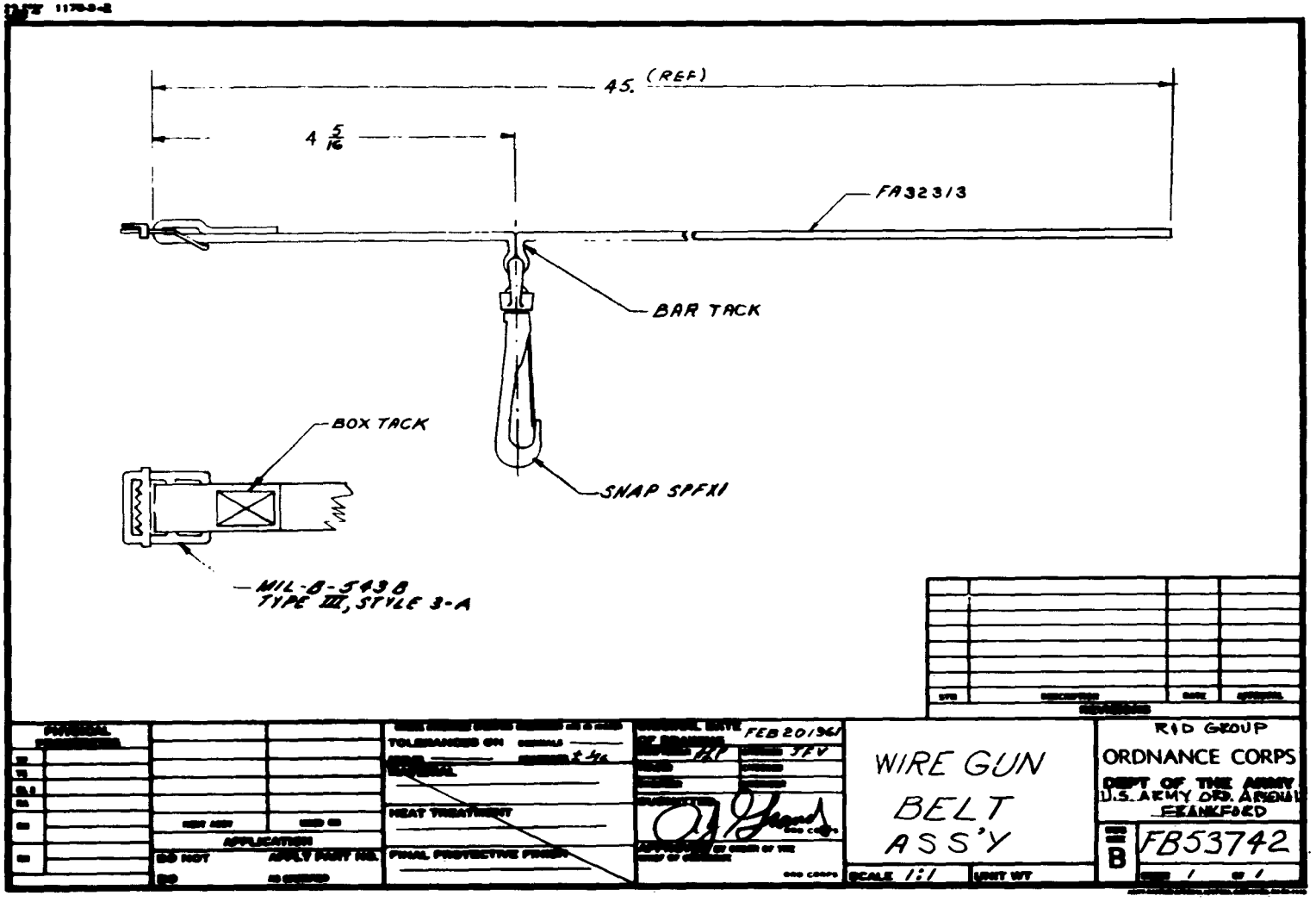


Figure B-20. Wire Gun Belt Ass'y

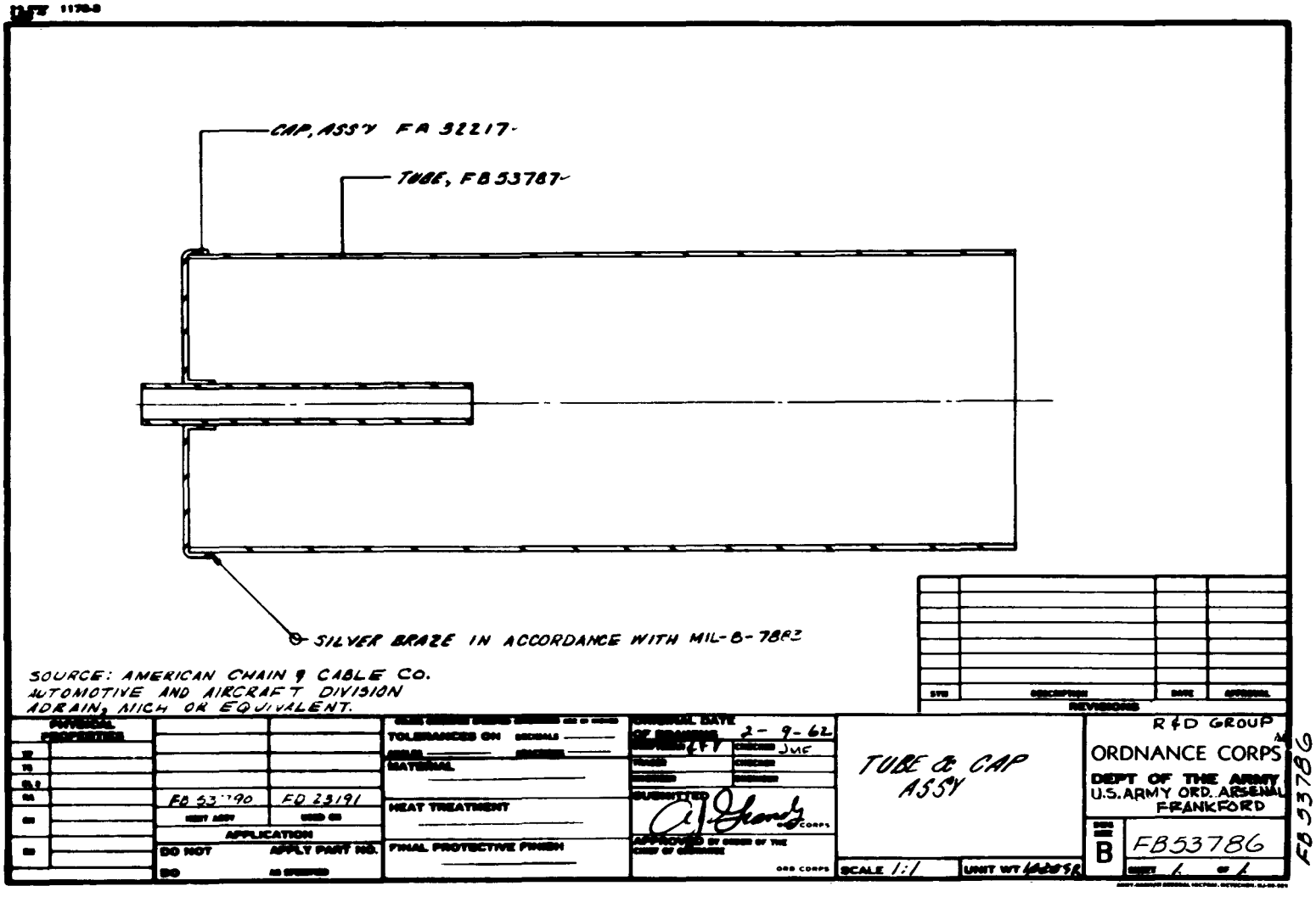


Figure B-21. Tube & Cap Ass'y

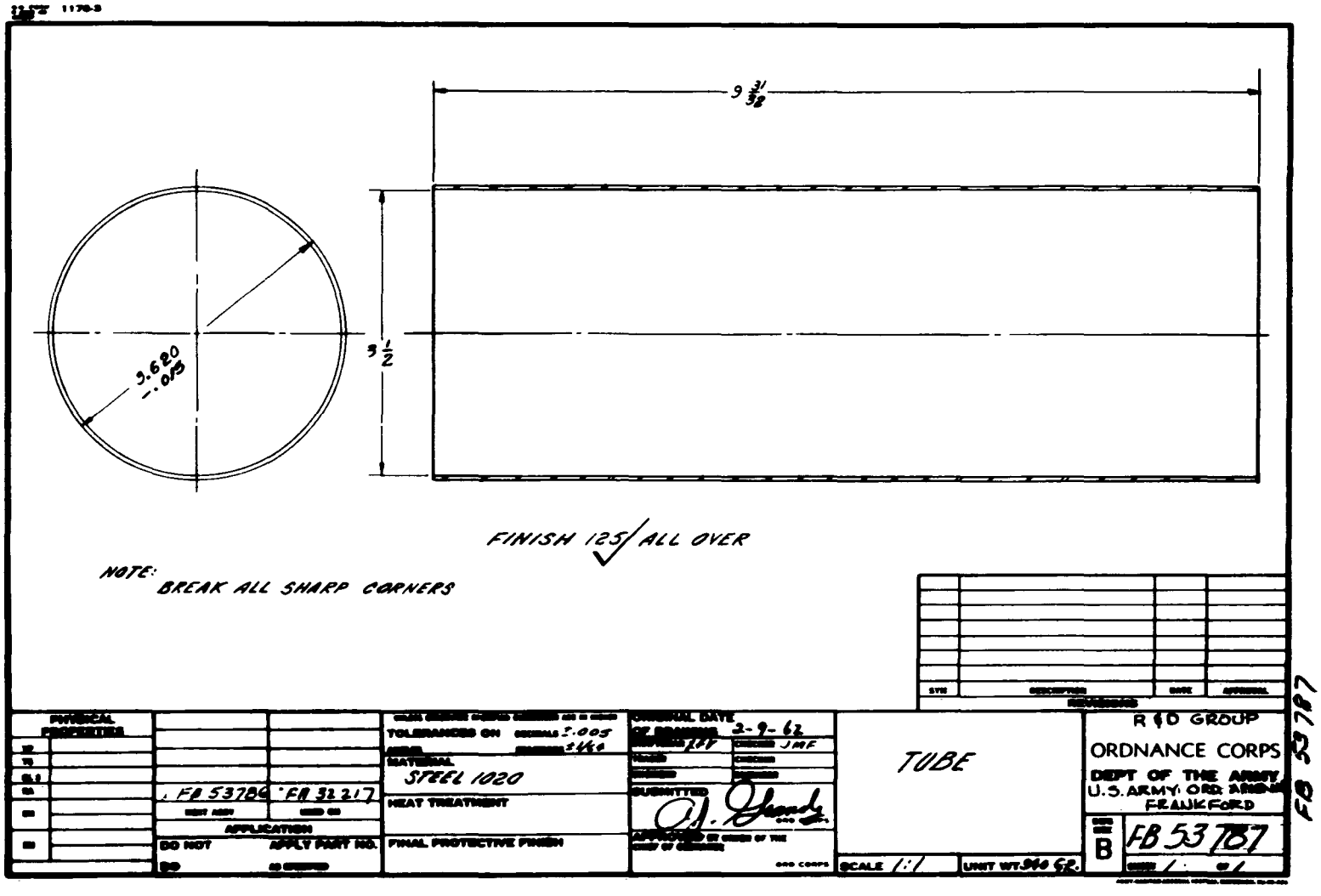


Figure B-22. Tube

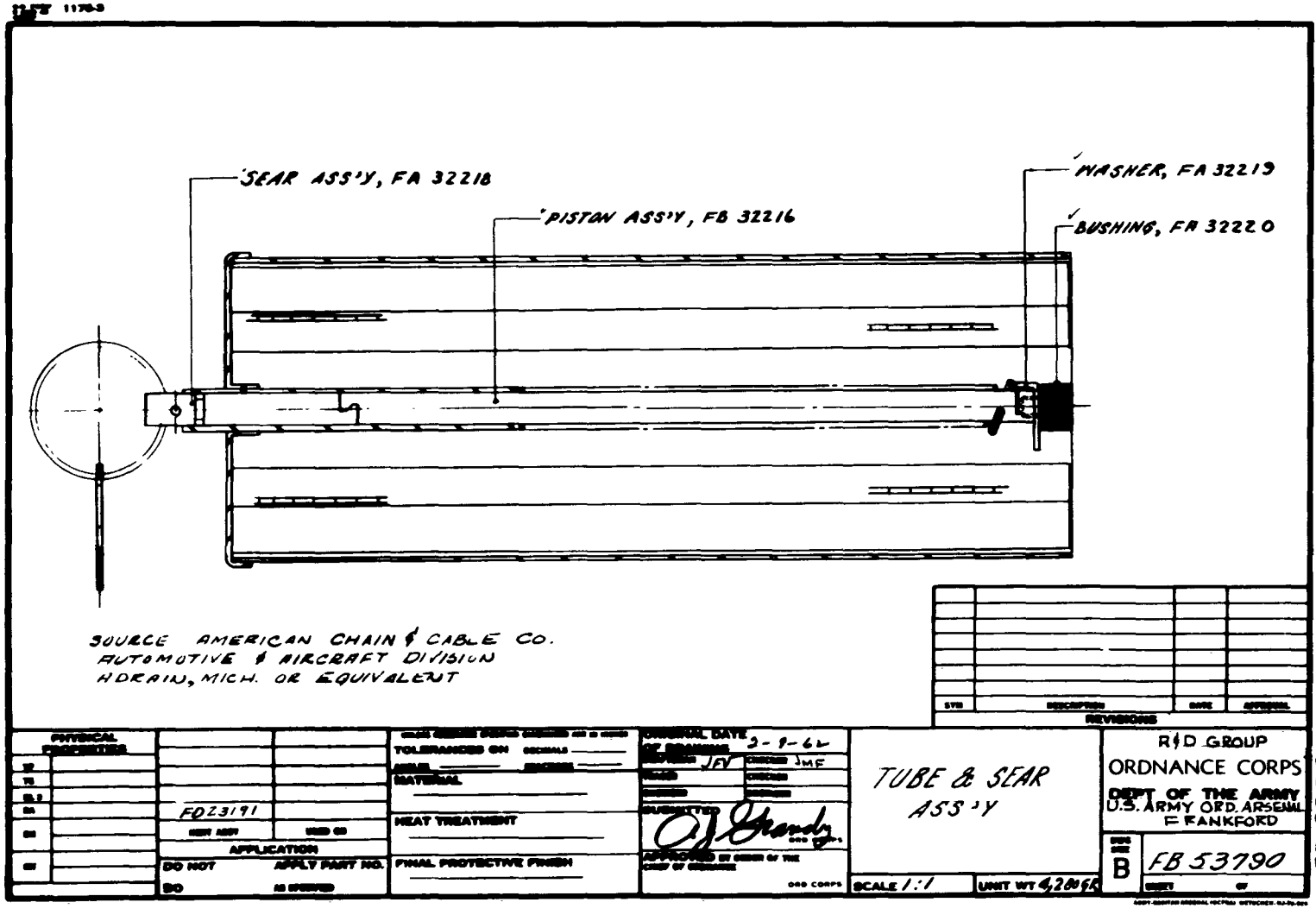


Figure B-23. Tube & Sear Ass'y

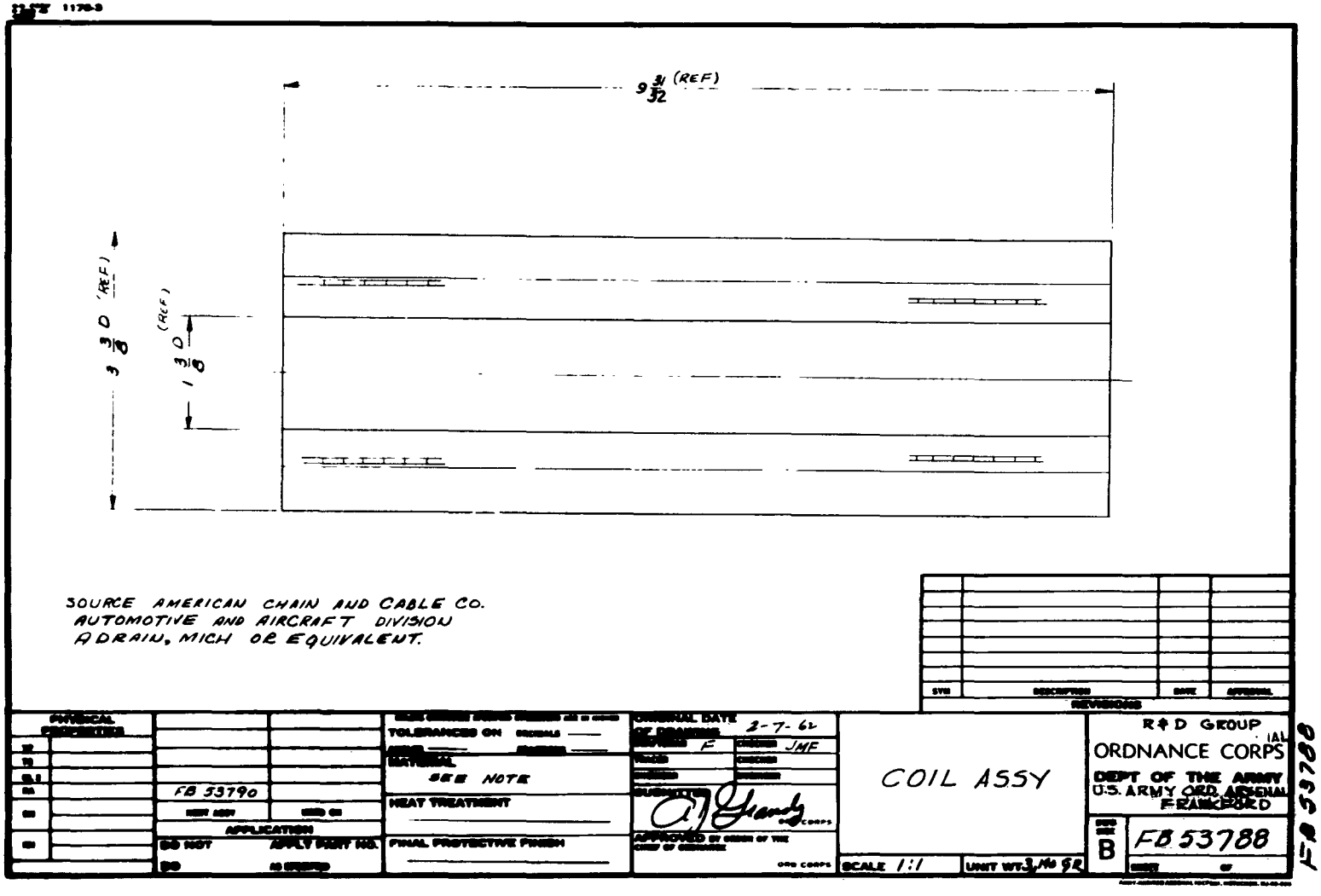


Figure B-24. Coil Ass'y

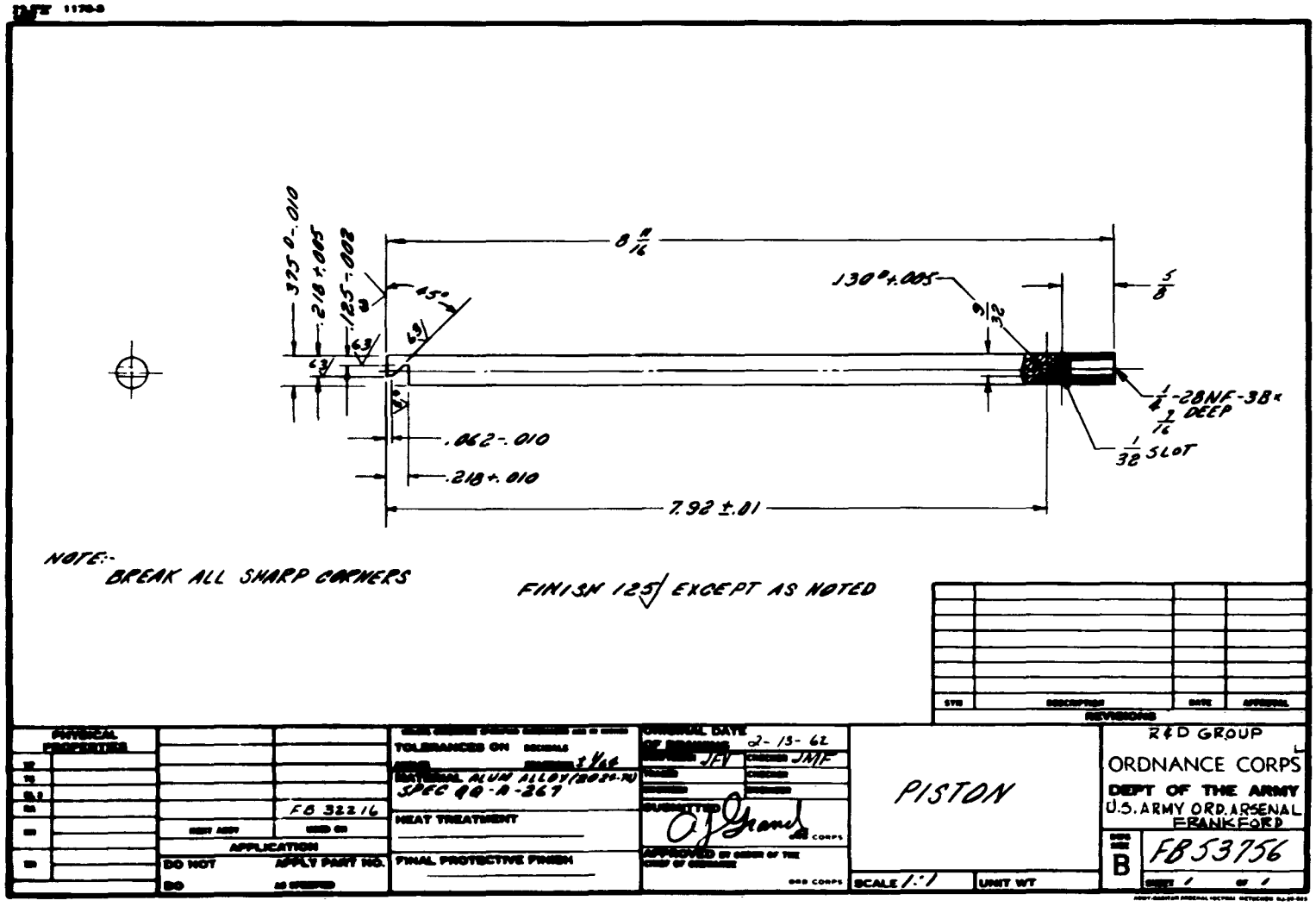


Figure B-25. Piston

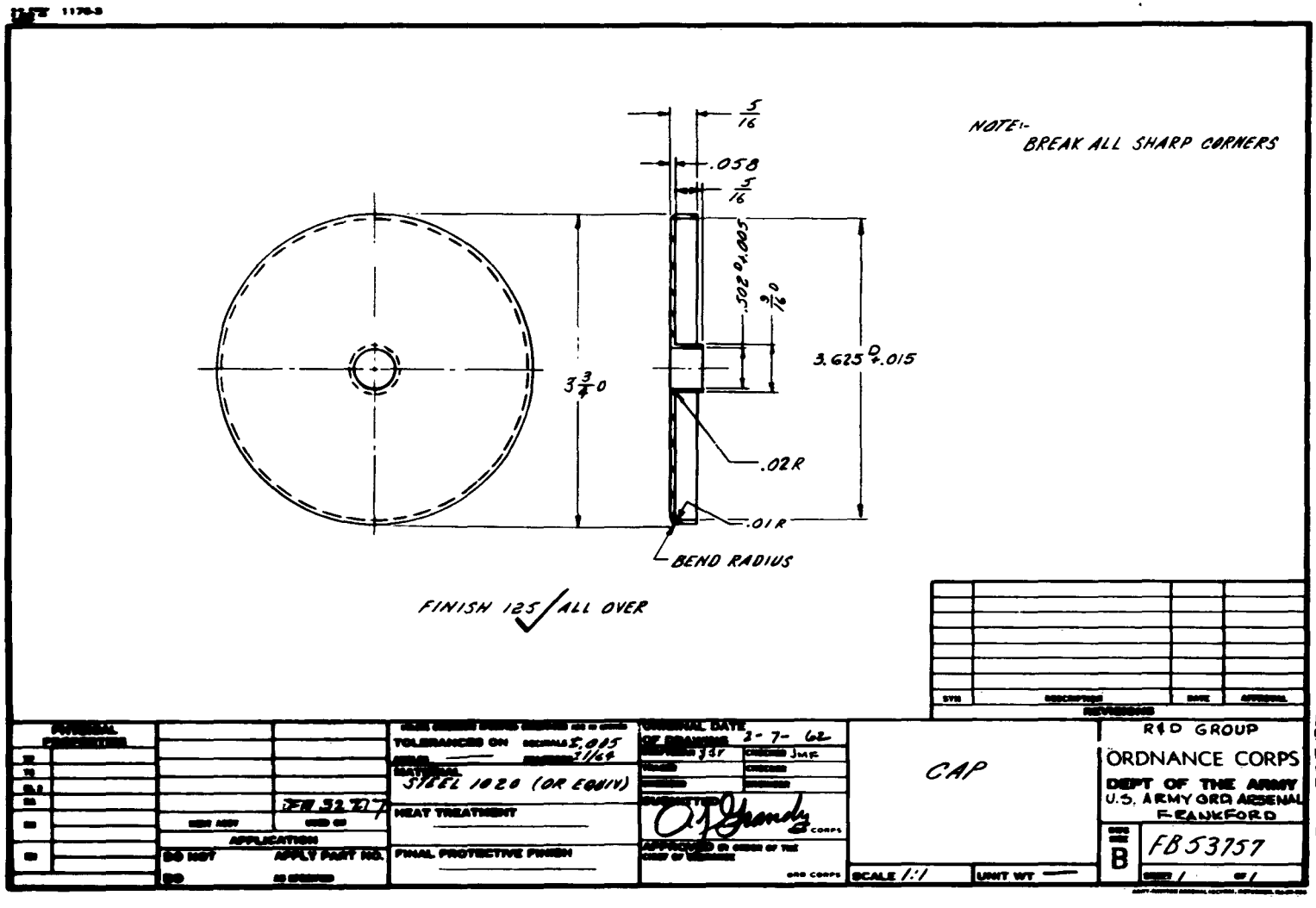


Figure B-26. Cap

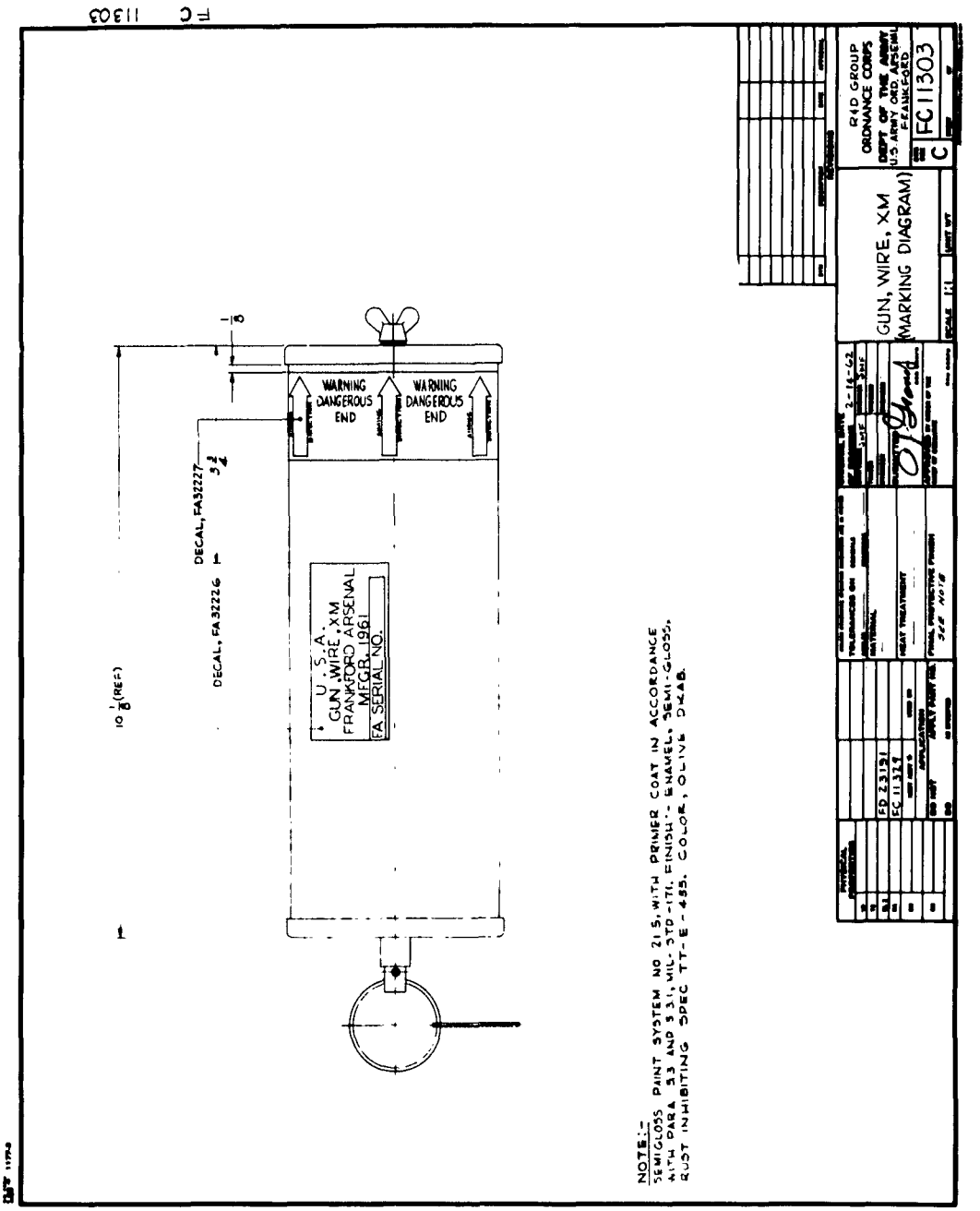


Figure B-27. Gun, Wire, XM (Marking Diagram)

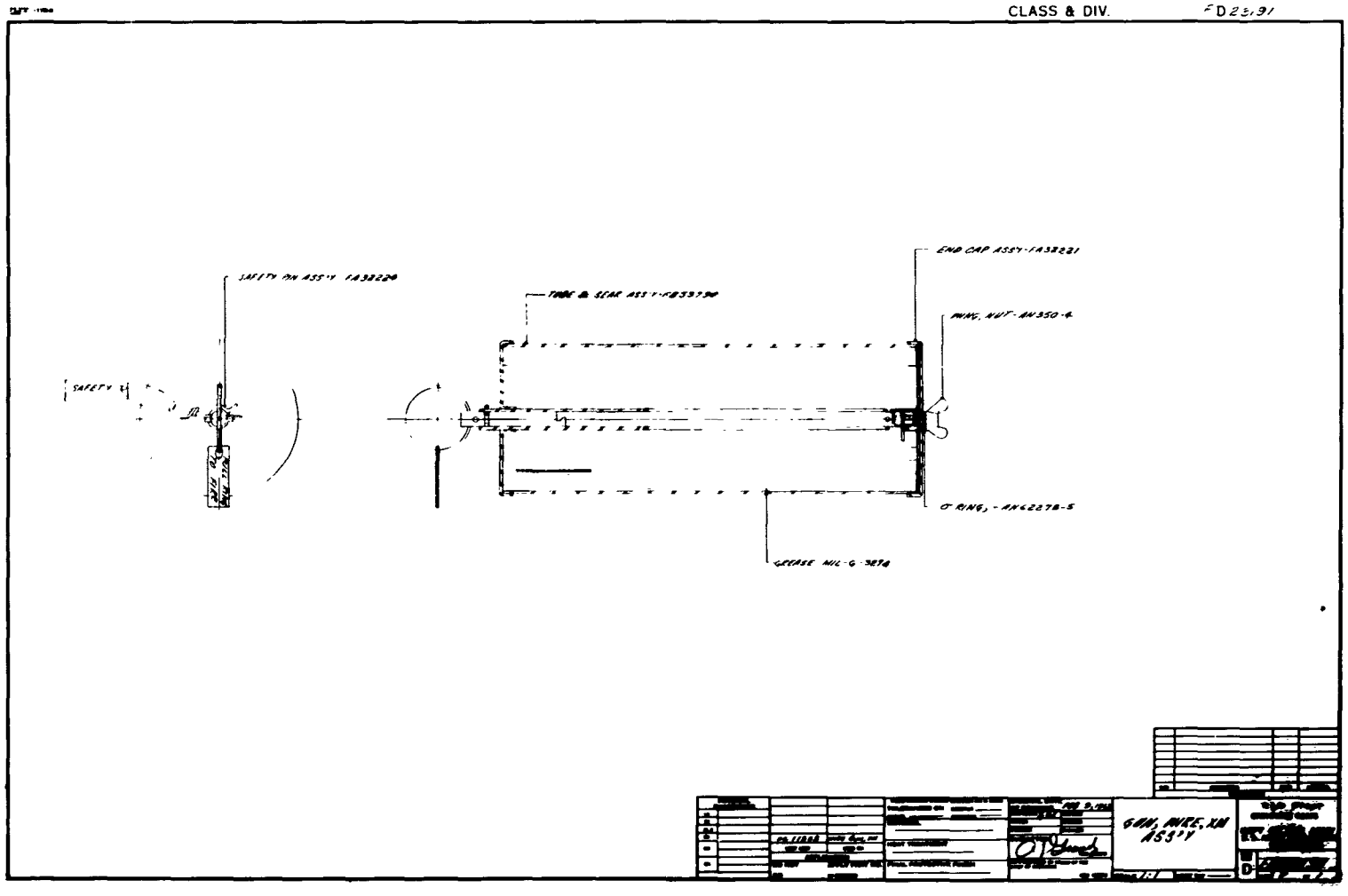


Figure B-28. Gun, Wire, XM Ass'y

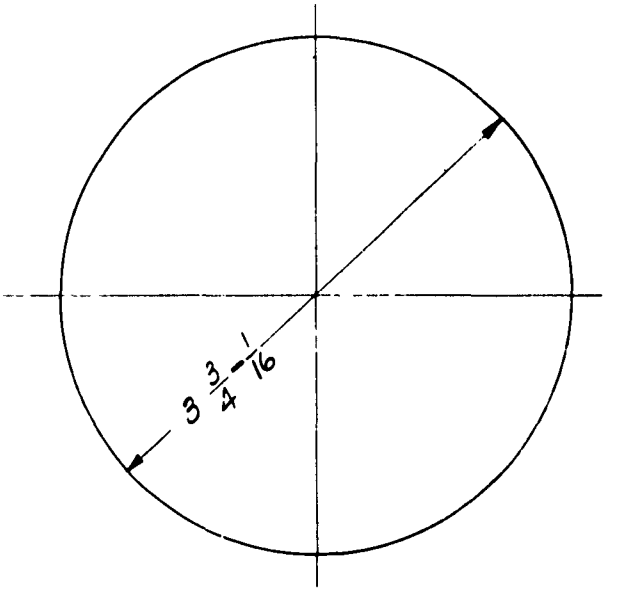
APPENDIX C

PACKAGING DETAILS

O.D. FORM 1181-3

MATERIAL PROPERTIES		APPLICATION		FA 32311
YP		NEXT ASSY	USED ON	
TS			FC 11329	
EL 2				
RA				
BH				
RH				
		DO NOT	APPLY PART NO.	
		DO	AS SPECIFIED	

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL



MATERIAL: 1/8 THICK SOLID FIBERBOARD
OR COMMERICAL CHIPBOARD
SOURCE: WHITEMARSH CONVERTERS INC.
COTTMAN ST. AND HASBROOK AV.
PHILADELPHIA 11, PA. OR EQUIVALENT

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON— DECIMALS — FRACTIONS — ANGLES —	ORIGINAL DATE OF DRAWING 16 FEB 62	FILLER	R&D GROUP ORDNANCE CORPS DEPT OF THE ARMY U.S. ARMY ORD. ARS. FRANKFORD
MATERIAL SEE NOTE	DRAFTSMAN JTF / CHECKER JTF		
HEAT TREATMENT	TRACER / CHECKER		
FINAL PROTECTIVE FINISH	ENGINEER / ENGINEER		SIZE A — FA 32311
	SUBMITTED O.J. Grant ORD CORPS		
	APPROVED BY ORDER OF THE CHIEF OF ORDNANCE ORD CORPS	SCALE 1:1	SHEET 1 OF 1

Figure C-1. Filler

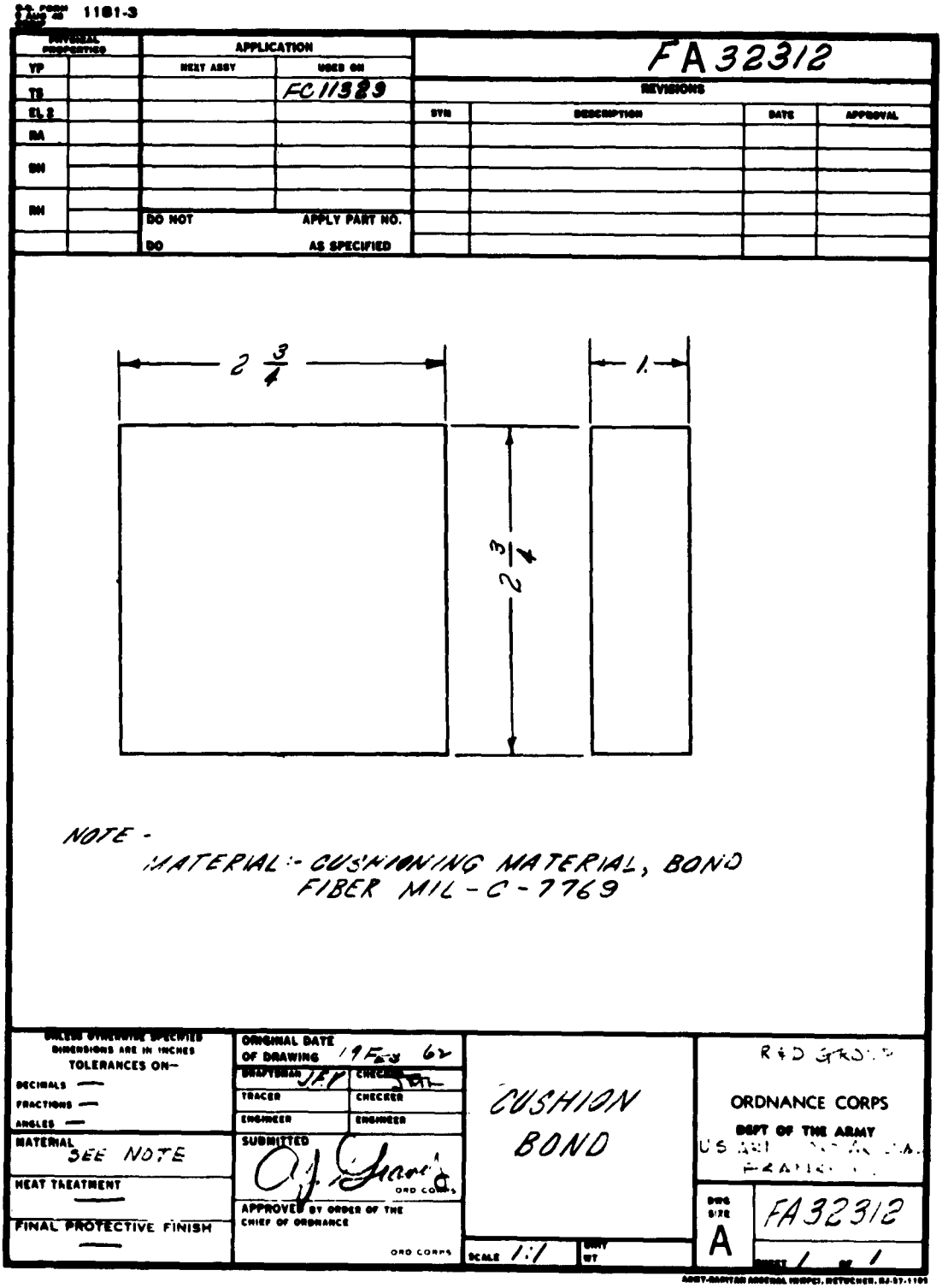


Figure C-2. Cushion Bond

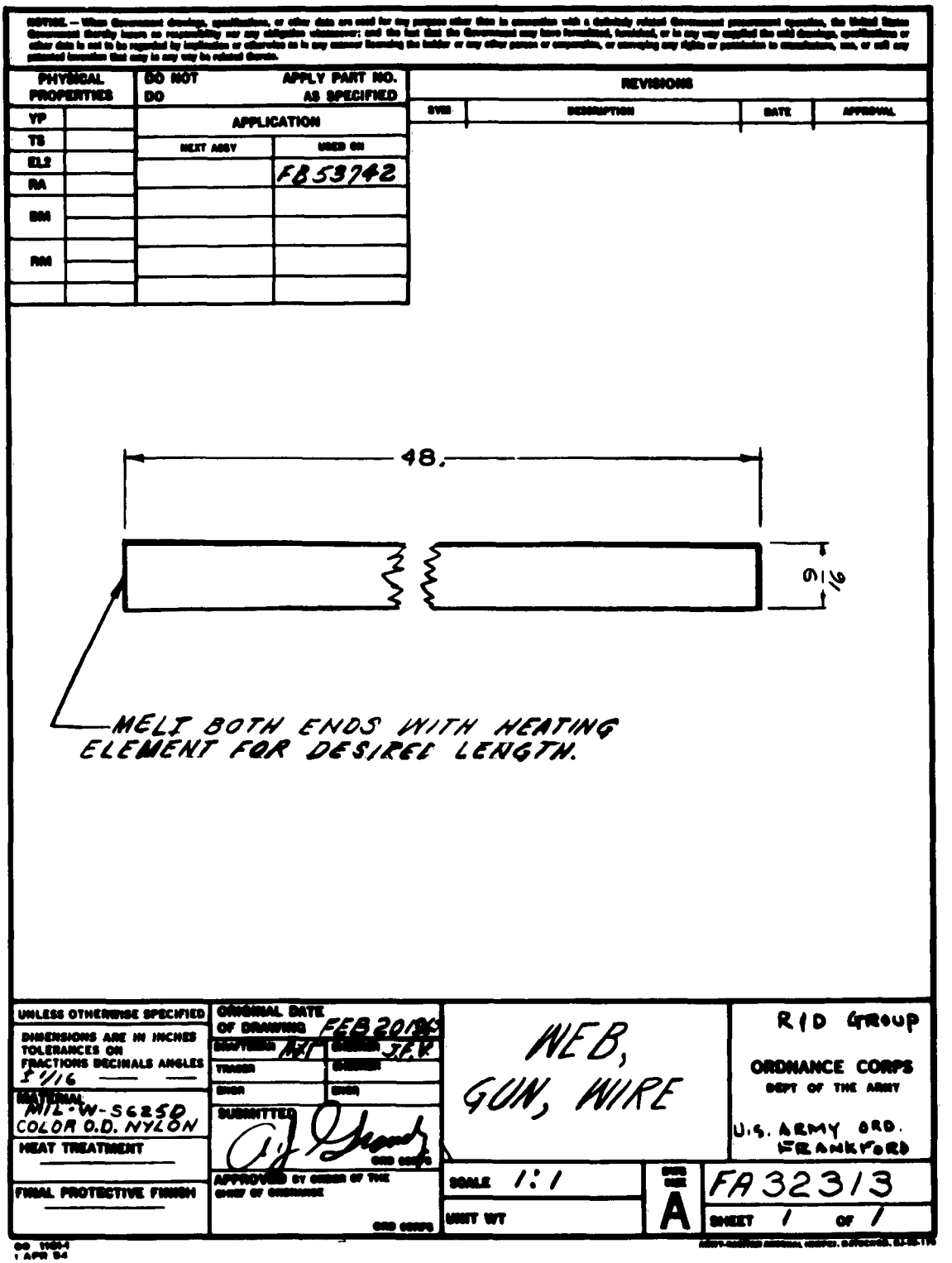


Figure C-3. Web, Gun, Wire

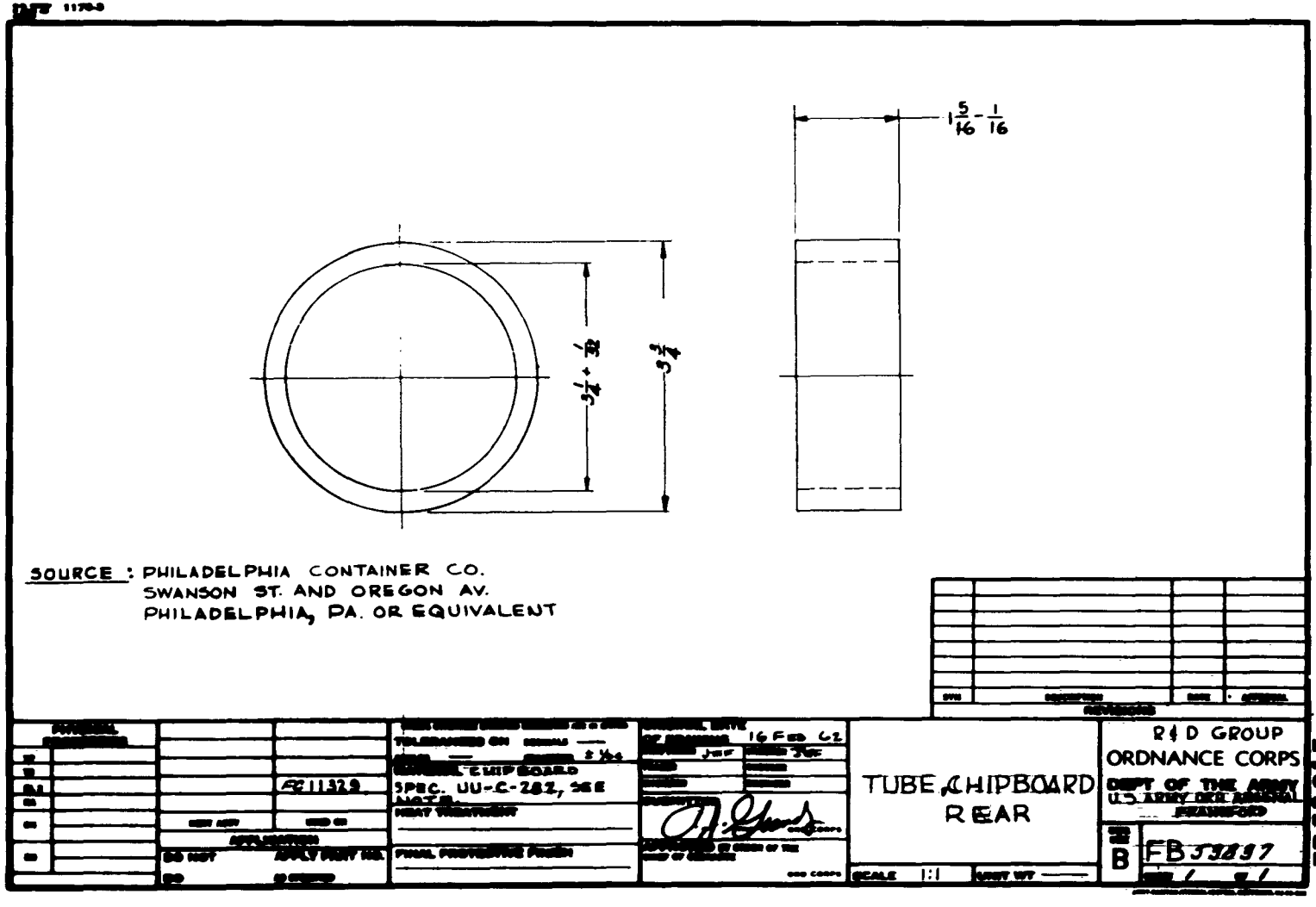


Figure C-4. Tube, Chipboard, Rear

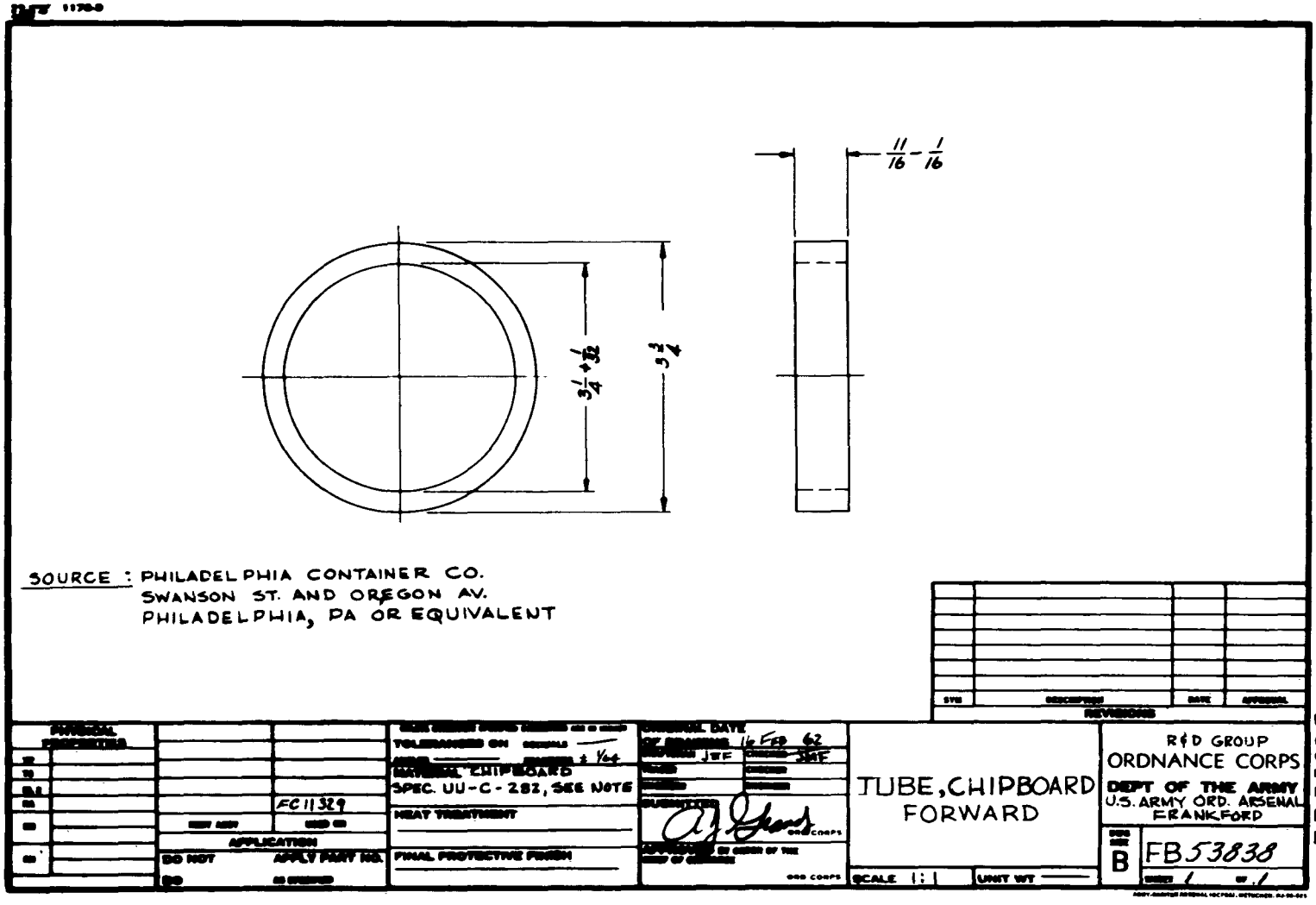


Figure C-5. Tube, Chipboard, Forward

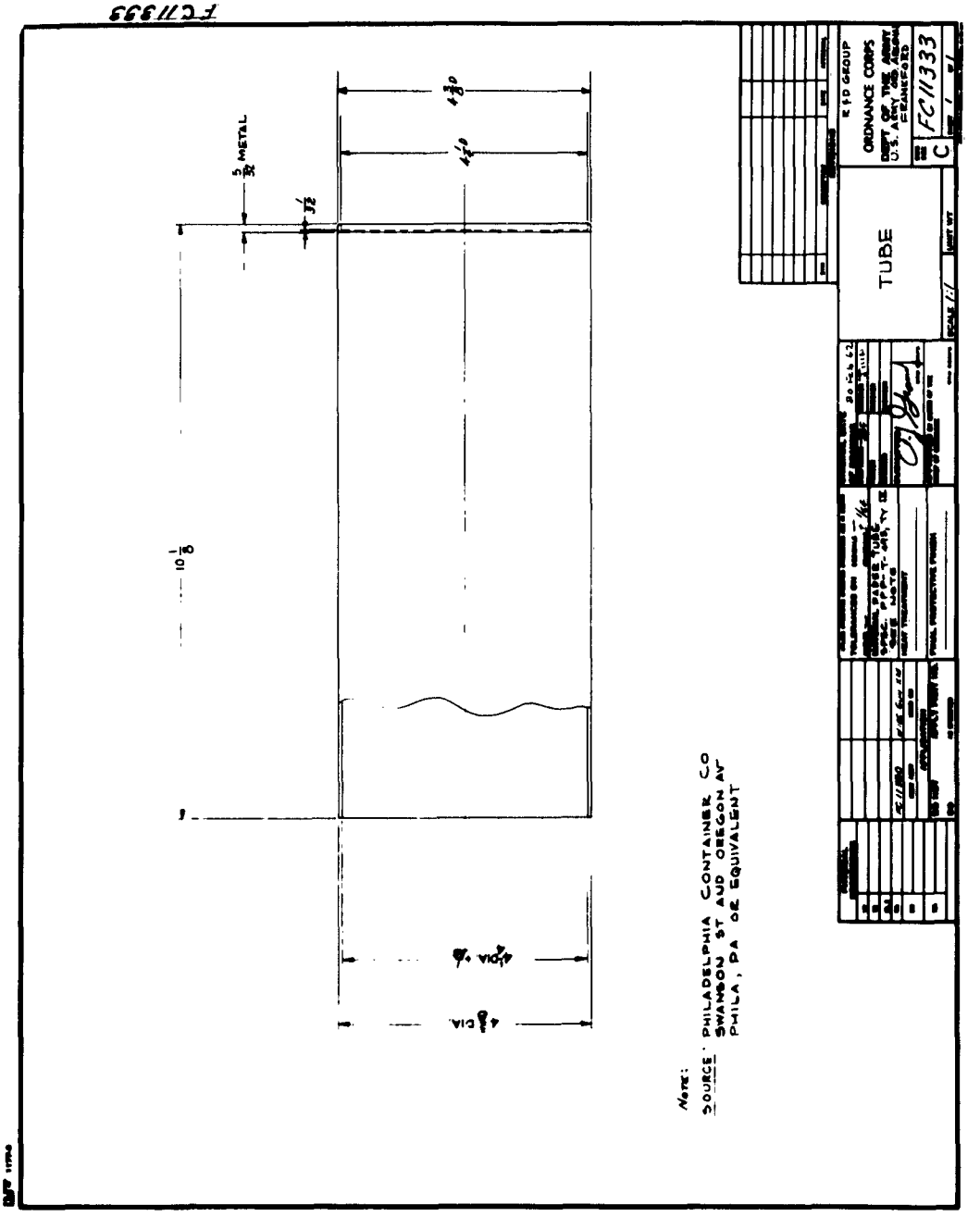


Figure C-6. Tube

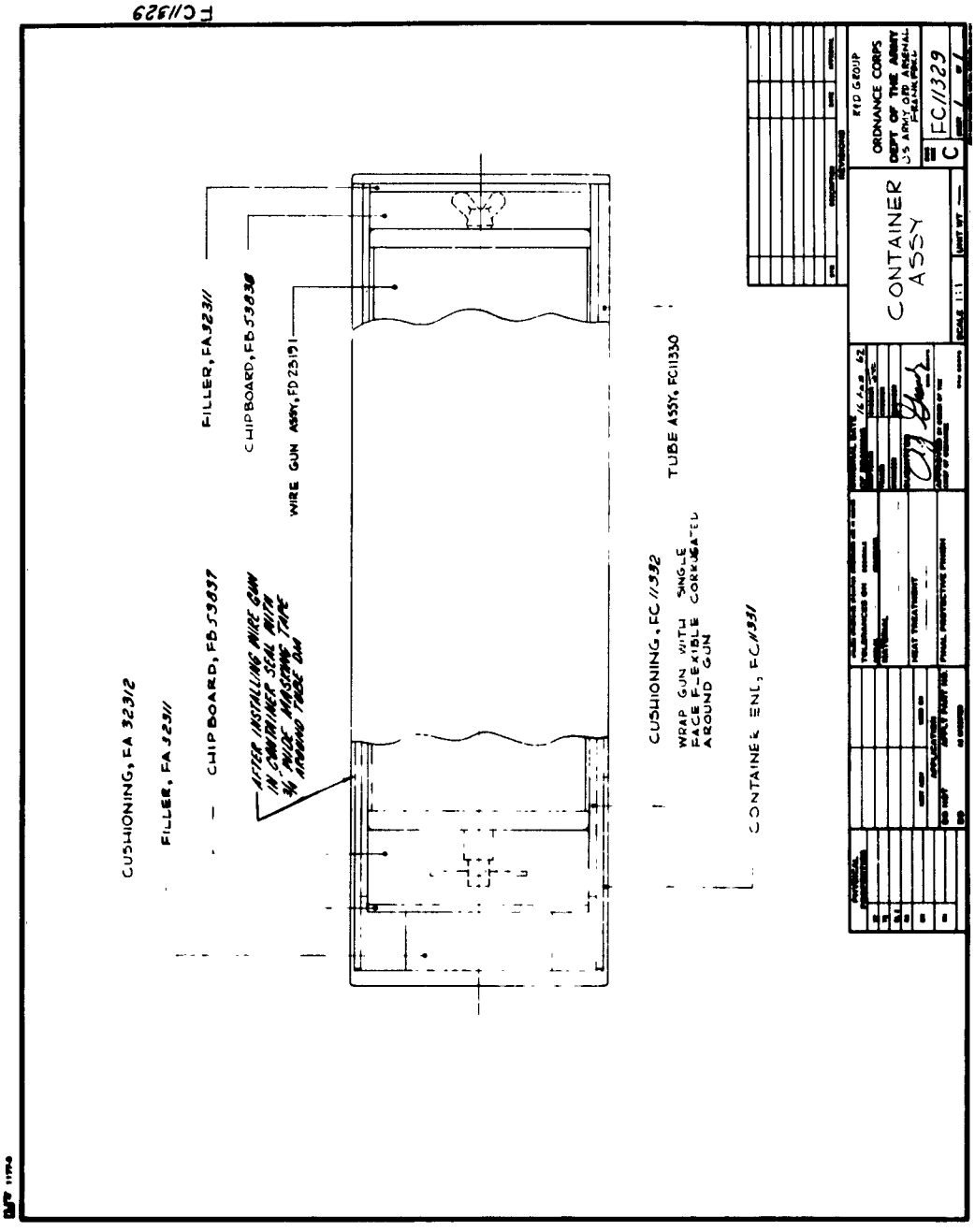


Figure C-7. Container Ass'y

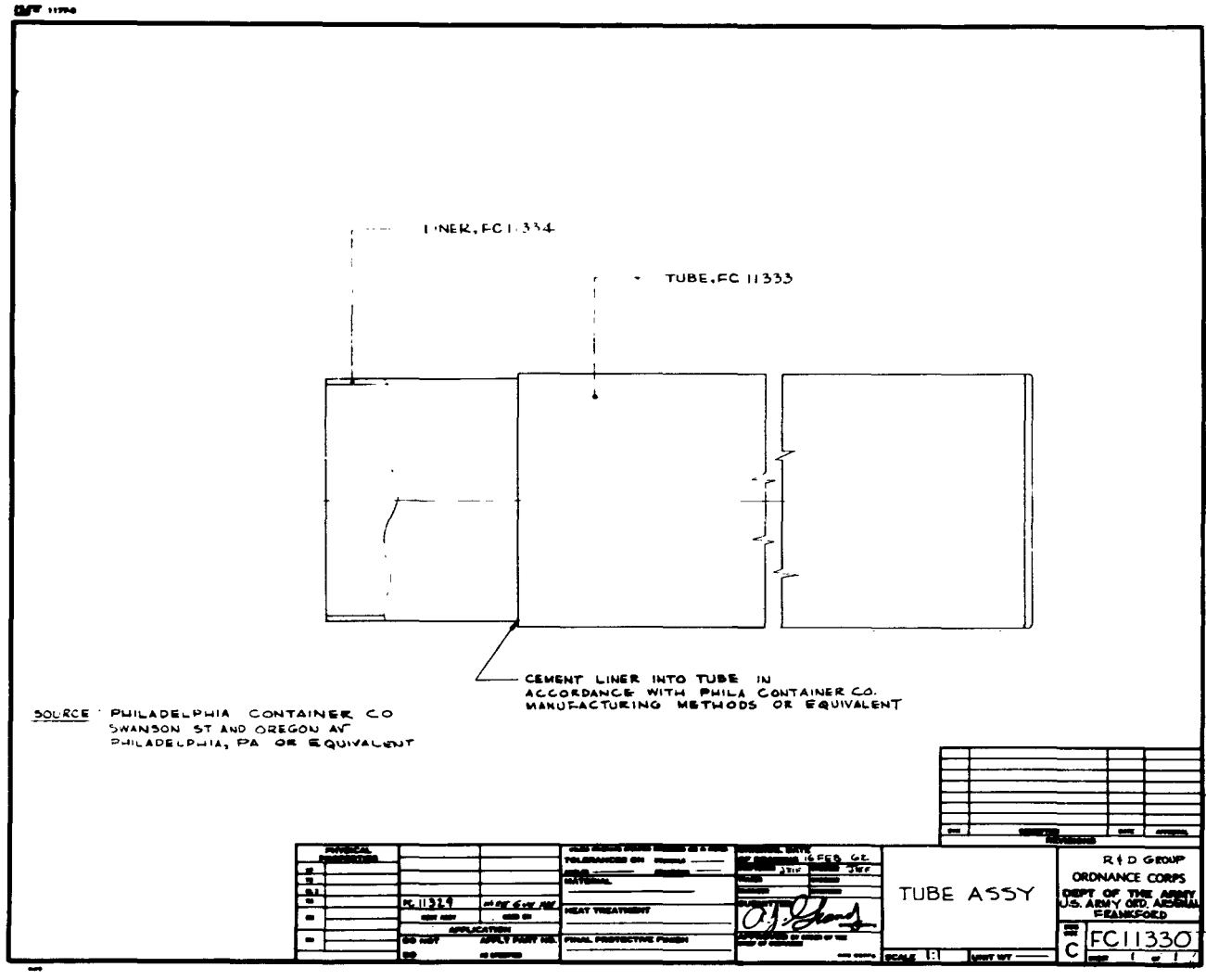


Figure C-8. Tube Ass'y

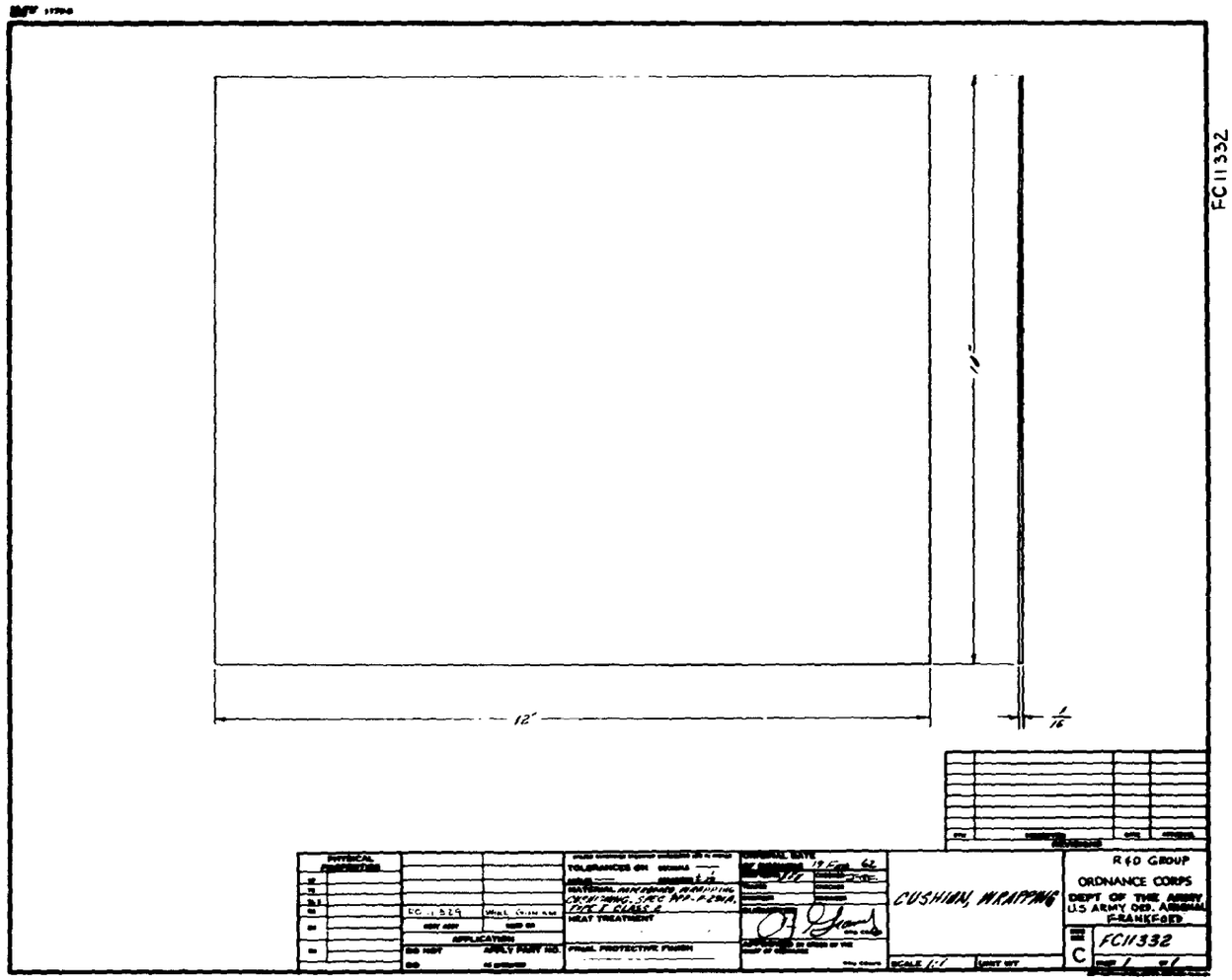


Figure C-9. Cushion, Wrapping

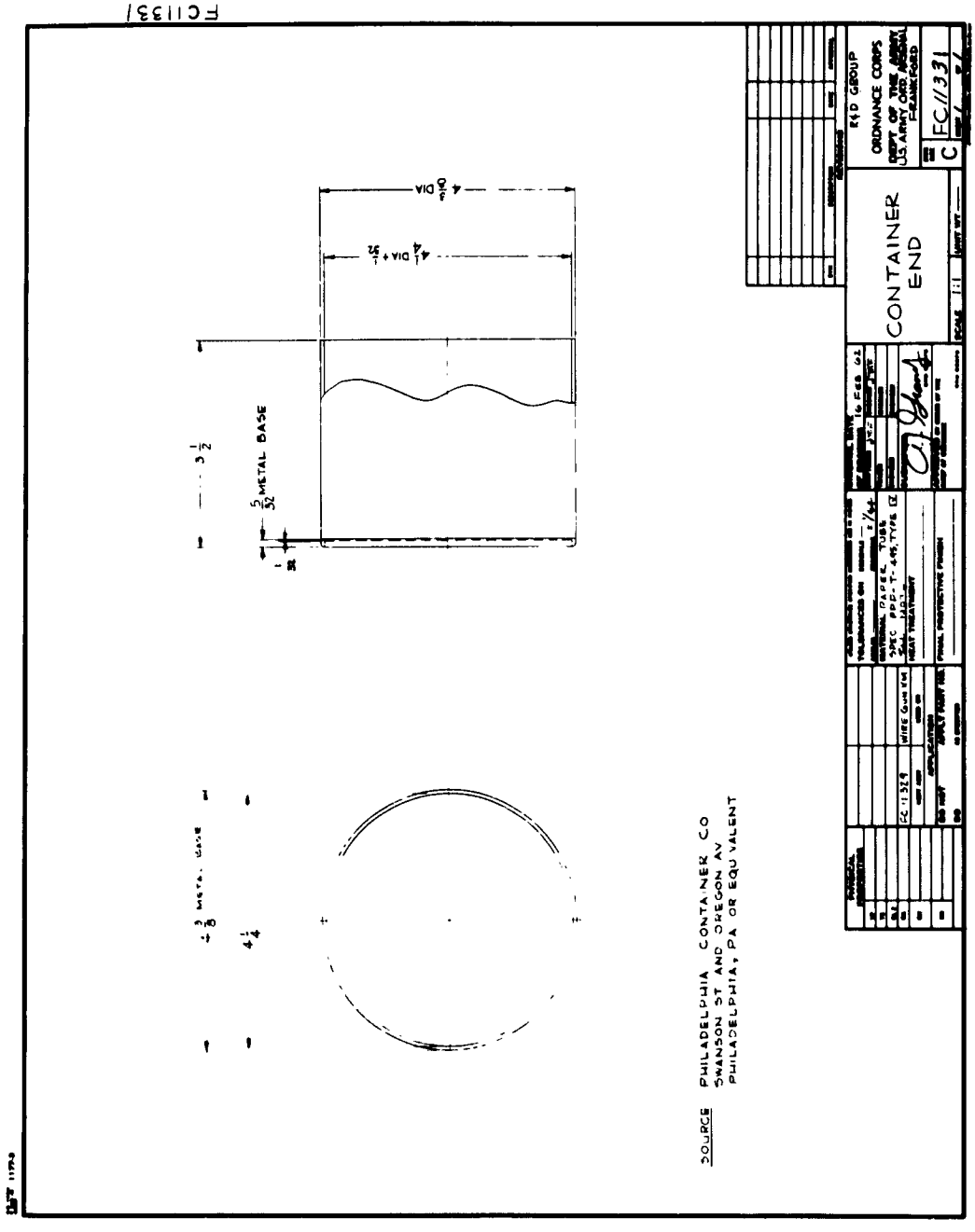


Figure C-10. Container, End

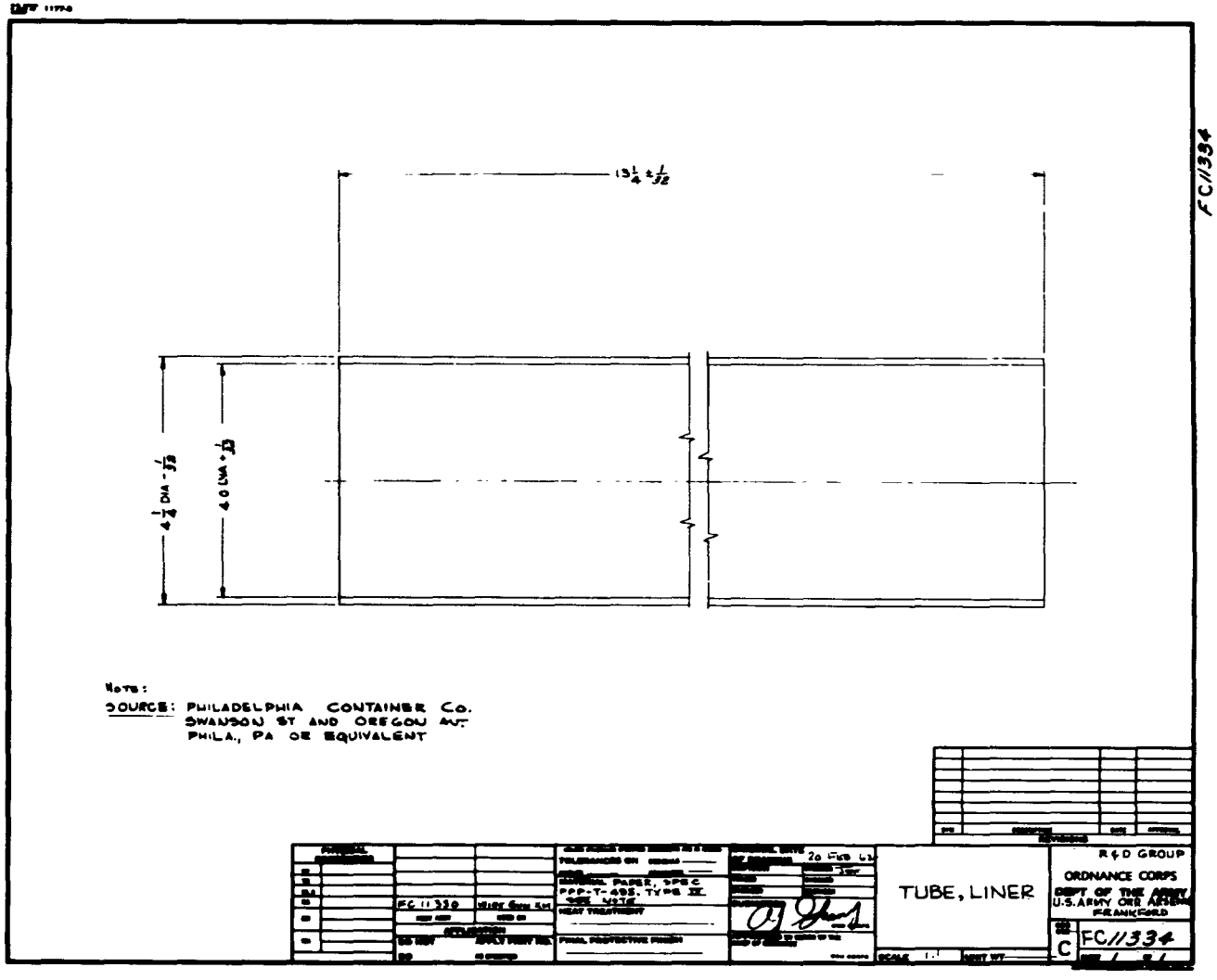


Figure C-11. Tube, Liner

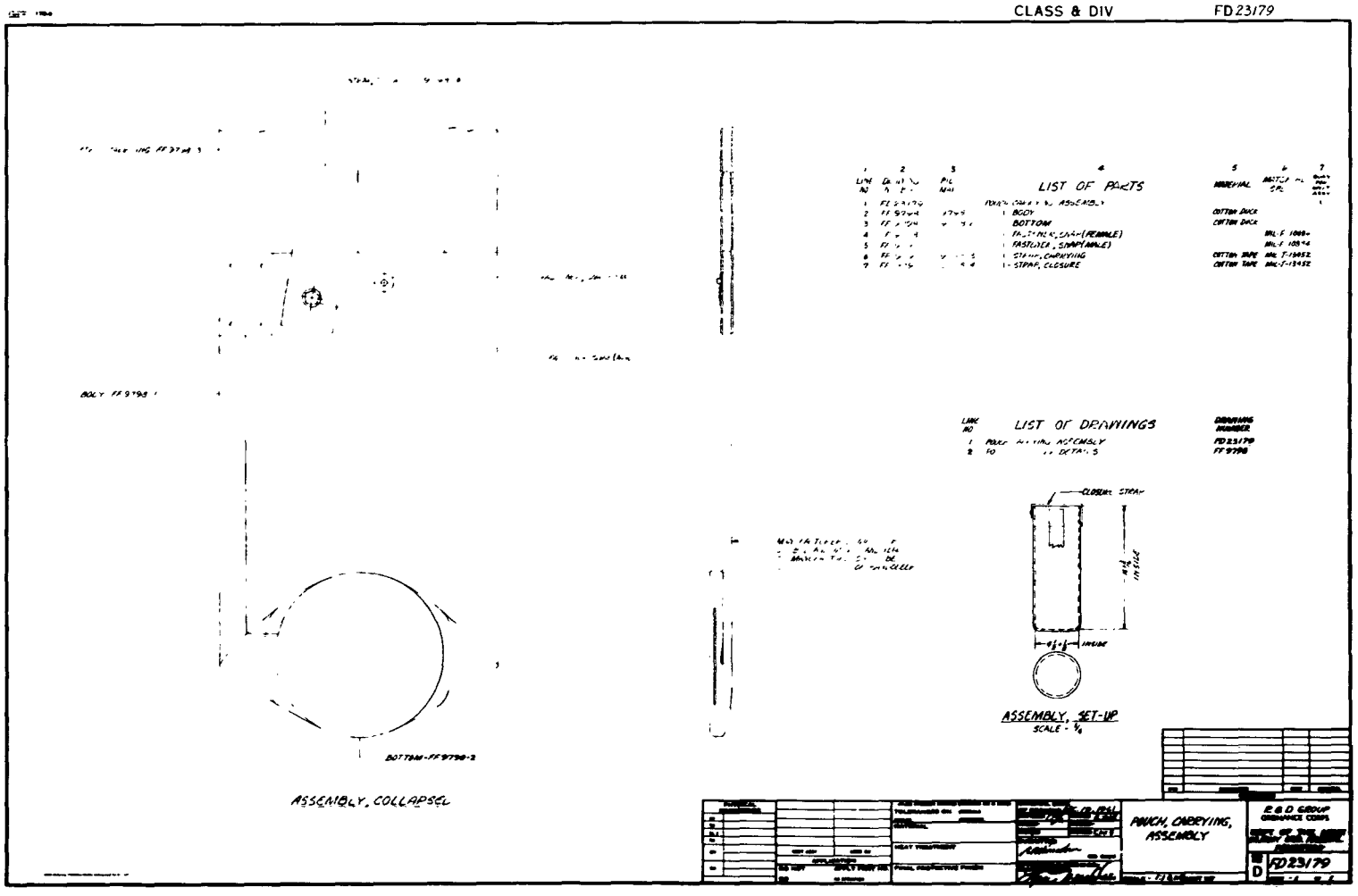


Figure C-12. Pouch, Carrying, Assembly

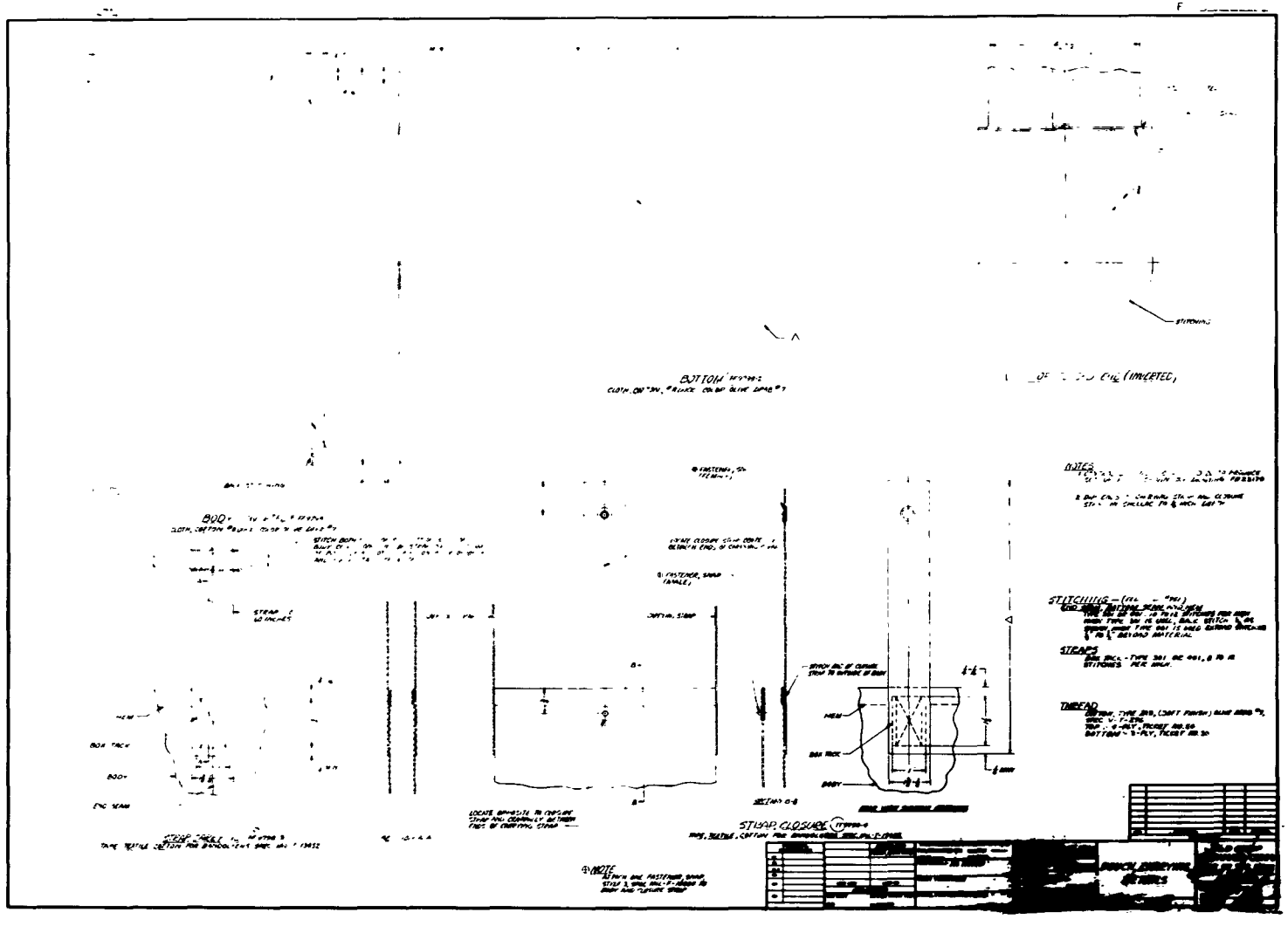


Figure C-13. Pouch, Carrying, Details

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M62-19-1

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DESCRIPTION AND OPERATION OF A HAND HELD WIRE GUN by A. J. Grandy and J. W. Hettel.

Memorandum Report M62-19-1, February 1962, 71 pp incl illustrations. (OMS Code 5520.12.468 IO, DA Project 596-10-001). UNCLASSIFIED REPORT

A hand held version of a wire gun was designed and developed, and a sample lot fabricated for use in controlled tests.

During limited development time the device displayed excellent operational characteristics. Further testing will be required to accurately determine adequacy against intended targets.

Complete descriptions of design and operation of this device are contained in this report.

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I. Grandy, A. J.
II. Hettel, J. W.
III. OMS Code 5520.12.468 IO
IV. DA Project 596-10-001

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